JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

AND

MECHANICS' REGISTER.

AUGUST, 1838.

Practical and Theoretical Mechanics and Chemistry.

Brief observations on Common Mortars, Hydraulic Mortars, and Concretes. By J. G. Totten, *Lt. Col. of Eng. and Brevet Col. United States Army.*

(Continued from p. 26.)

Article xxv.—*Some recent experiments with Mortars made of Lime and Sand.*

There will be presented, in conclusion, some experiments, made very recently at Fort Adams, with lime mortars without cement; they were instituted in reference to the best proportions of lime and sand, and also to a comparison of coarse and fine sand, and salt and fresh water.

In making these, a cask of fresh Smithfield lime, of the best quality, was taken, and the lumps broken into pieces of about the size of a pigeon's egg. These being carefully screened, in order to get rid of all dust and fine lime, and carefully intermixed, in order to obtain uniformity of quality throughout, were slaked by the affusion of water to the amount of one third the bulk of lime. When cold, the slaked lime was returned to the barrel, which was carefully headed and put in a dry place; and on all occasions of withdrawing a portion of this lime for use, the cask was carefully re-headed.

The sands used were those described in page 4, as sand No. 1, sand No. 2, sand No. 3, and sand No. 4.

In making the mortars, just enough water was added to the slaked lime taken from the cask, to make a stiff paste. This paste being passed through a hand paint mill, which ground it very fine, was mixed, by careful manipulation, with the due proportions of sand. Much care was bestowed upon the operation of filling the prism-moulds with mortar; and each prism was submitted to a pressure of 600 lbs. for a few minutes, that is to say while the succeeding prism was being formed.

About one week was consumed in preparing the prisms—namely, from

the 7th to the 15th of May, 1838. And they were broken on the 1st of July, 1838, making the average duration of the experiment, 50 days.

Three prisms were made of each composition. But, on the principle that there are several causes which tend to make a prism weaker than it should be, and few or none that tend to make it stronger, only the maximum result of each experiment is given in the following table.

It may, however, be well to state that precisely the same inferences are deduceable, if the mean of the results be taken instead of the maximum.

Table No. LXX.

Trials made on the 1st of July, 1838 of the strength of the mortars made between the 7th to 15th of May, 1838 (50 days.) The results show the weights, in pounds, required to break prisms of mortar 6 inches long, by 2 inches by 2 inches: the distance between the supports being 4 inches, and the power acting midway between the supports.

Composition of the mortars.	Sand No. 1.—Lime. Fresh water.	Sand No. 2.—Lime. Fresh water.	Sand No. 3.—Lime. Fresh water.	Sand No. 4.—Lime. Fresh water.	Sand No 1.—Lime. Salt water.	Sand No. 3.—Lime. Salt water.
Lime in stiff paste 1—Sand 0	262½					
do. 1 do. ¼	224	220½	248½	353½	192½	234½
do. 1 do. ½	213½	234½	234½	241½	210	199½
do. 1 do. 1	248½	220½	227½	234½	178½	178½
do. 1 do. 2	164½	199½	161	178½	140	178½
do. 1 do. 3	157½	189	185½	157½	119	119
do. 1 do. 4	126	227½	157½	136½	101½	154

Observations on the experiments of table No. LXX.

1st. Within the limits of the experiments, the mortar was the stronger as the quantity of sand was the less—in 96 comparisons, 12 exceptions.

2nd. Although the above inference is derived from the whole range of the table, still, when the quantity of sand was less than the quantity of lime, the weakening effect of the sand on the mortar was not very sensible. And it would seem from table No. LXV. that from one-fourth to one-half of sand may be slightly beneficial.

3rd. It appears that coarse sand, or, rather, sand composed of coarse and fine particles, (sands No. 1 and 2,) is a little inferior to sand that is all fine (sands No. 3 and 4;) in 36 comparisons, 16 exceptions; and also that sand reduced by pounding to a fine powder (No. 4,) afforded some of the best results of the table. It is to be regretted that no experiments were instituted in order to compare sand all coarse, with sand all fine.

4th. It appears that the mortars made with salt water—that is to say, the water of the ocean, was decidedly weaker than those made with fresh water; 1 exception in 12 comparisons. The aggregate strength of all the

prisms made of coarse sand and salt water was 2674 lbs.; while the aggregate strength of the corresponding prisms of coarse sand and fresh water was 3174 lbs. And the aggregate strength of all the prisms of fine sand and salt water was 2800lbs. while the aggregate strength of the corresponding prism of fine sand and fresh water was 3346 lbs.

Description of the Plates.

PLATE I.

Fig. 1. *a*, *a*, Prism of mortar under trial.
b, *b*, Iron stirrups, supporting the prism.
c, *c*, Iron collar, embracing the prism.
d, *d*, Iron link, to which the ropes of the scale-pan are fastened.
e, *e*, check, against which the collar rests when on the middle of the prism.
f, *f*, Timber, to which the stirrups are attached.
g, Scale pan, in which the weights to break the prism are put.
Fig. 2. *h*, Interior of the furnace.
i, Door of the furnace.
k, *k*, Chimney.
l, Register.
m, *m*, Arches, under the hearth, in which the fuel is placed.
n, *n*, Conduits, to lead the flame and a current of air into the furnace.
Fig. 3. *o*, Plan of lime kiln.
p, *p*, Nut of the kiln.
q, *q*, Steps descending to the doors of the kiln.
r, Steps, up which the materials are carried to the top of the kiln.
s, *s*, Doors of the kiln.
t, *t*, Portions of spherical arches leading to the doors of the kiln.

PLATE II.

Figs. 4, 5, 6, 7 and 8, represent Mr. Petot's "*curves of energy*" of fat lime, hydraulic lime—plaster-cements—calcareous puzzolanas, and clay.
Fig. 9. *a*, *b*, Half staples, driven into the floor.
f, *g*, A pair of bricks united by mortar.
c, *c*, Iron piece, embracing the ends of the upper brick, and suspended from the steelyard.
d, Steelyard.
e, Bucket, into which sand flowed from the trough.
h, Trough.
i, Floor.
Fig. 10. *a*, *b*, *c*, Iron lever, with a steel point at *a* to impress the mortar *f*, on the brick *g*.
d, Steelyard, connected with the lever *a*, *b*, *c*, at *c*.
e, Iron rod, from which the steelyard is suspended.
h, *h*, Uprights, supporting the rod *e*.
i, Uprights of iron, supporting the fulcrum of the lever *a*, *b*, *c*.

Physical Science.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Note on the Solar Eclipse of May 15th, 1836, by SEARS C. WALKER.

In the Journal of the Franklin Institute, vol. xvii, p. 246, 1836, I have given the formulæ for the ready announcement of the phases of this eclipse, and in vol. xviii, p. 97, a modification of the same for determining the longitude from Greenwich, of places of observation near Philadelphia. The arrival of the European observations and computations relative to this eclipse, has furnished the means of reducing the observations made in this country, and of determining longitudes with an accuracy nearly equal to that of the observations themselves. There are two principal methods by which such computations are made. The first, which is the one generally employed in this century, consists in deducing from the observation the local time of new moon; then the difference of the local times of the same event are taken for the difference of longitude of the places of observation. But since the errors of the tables affect these local times of new moon differently at different places, allowance must be made therefor to obtain the true differences of longitude.

The European observations of this eclipse have been reduced in this manner by a distinguished astronomer, C. Rümcker, of Hamburg. His computations have furnished him the following approximate corrections of the elements of the eclipse as given in the Berlin Jahrbuch.

(1)···· $\Delta\beta = -7.''63$ = cor. moon's tab. latitude.
$\Delta(\odot+\mathfrak{D}) = -1.''00$ = cor. tab. sum of semidiameters.
$\Delta(\odot-\mathfrak{D}) = -2.''00$ = cor. tab. difference.
$\Delta\pi = 0.''00$ = cor. moon's tab. parallax.

These corrections he has left subject to a more full discussion when a greater number of observations is obtained. Rumcker's computations are published in Schumacher's Astronomical Notices, No. 319. A translation of them may be found in the London & Edinburgh Philosophical Magazine, vol. x, p. 180, 1837, with the formulæ by which they are made. These formulæ are given more at length in this author's interesting paper on the solar eclipse of the 3—4 March 1840, (received through the politeness of Prof. A. D. Bache) which is one of the best models yet published of this method of reducing the observations of a solar eclipse.

The second method consists in making the unknown quantity the longitude sought, and in deducing from the observations, an approximate value for this longitude to be afterwards corrected for the effect of the errors of the tables, which, as in the other method is different at different places. This method founded on the fundamental equation of eclipses originally published by Lagrange in the Berlin Jahrbuch, for 1782, was first given to the world by Bessel in the Astronomical Notices, No. 151 and 152, and received from its author, the finishing hand in 1836 in a paper No. 321, on the then recent eclipse of May 15th. In reading these papers we are astonished at the genius of the analyst who has succeeded in giving a new and more perfect form to the method of reducing this kind of observations, as he has by his former works to most of the computations in practical astronomy. Mr. Bessel here reduces the principal corrections of the tabular errors to the three following, viz: of the moon's tabular place on the orbit—

—on a perpendicular to the orbit—and of the sum or difference, of the un's and moon's assumed semidiameters; which he denotes severally by s, ζ, and η or η'. He also points out an error to which many of the reductions of eclipses and occultations by the old method have been liable where the longitude is not well ascertained—and which, where the duration is short, may wholly vitiate the result. This source of error consists in the assumption of the constancy of the moon's latitude or declination during a time equal to the required correction of the assumed longitude.

A complete discussion of the European observations after Bessel's method, is given by H. C. F. Peters, in No. 326, of the Astronomical Notices. From them he deduces the following corrections of the elements derived from the Berlin Jahrbuch.

$$(2)\cdots\quad \begin{aligned} s &= -3.''650 - 0.0082\eta' + 0.0007\eta \\ \zeta &= -5.''472 - 0.1590\eta' \end{aligned}$$

Where

$$\begin{aligned} \eta &= \Delta(\odot + \mathfrak{D}) \text{ of Rümcker nearly.} \\ \eta' &= \Delta(\odot - \mathfrak{D}) \quad " \quad " \quad " \end{aligned}$$

This value of ζ is derived from the observed duration of the ring at Braunsburg, Pillau, Rostock, Stralsund and Copenhagen (Round Tower.) That of s is derived from the observations of the beginning and end at Altona, Berlin, and Königsberg. The coefficients of η and η' are so small that no sensible error can arise from neglecting them. To change s and ζ into right ascension and declination, recourse may be had to Bessel's formulæ. Astr. Nachr. vol. x, p. 138.

$$(3)\cdots\quad \begin{aligned} s &= \quad \sin.N.\cos.\delta\,\Delta\alpha. + \cos.N.\,\Delta\delta \\ \zeta &= -\cos.N.\cos.\delta\,\Delta\alpha. + \sin.N.\,\Delta\delta - \varkappa\cos.\pi\,\Delta\pi \end{aligned}$$

Whence

$$^{s}(4)\cdots\quad \begin{aligned} \Delta\alpha &= [s\sin.N. - \zeta\cos.N. - \varkappa\cos.N.\cos.\pi\,\Delta\pi]\sec.\delta \\ \Delta\delta &= \quad s\cos.N. + \zeta\sin.N. + \varkappa\sin.N.\cos.\pi\,\Delta\pi \end{aligned}$$

The moon's nearest approach to the sun in her true orbit, takes place at 3h mean time Berlin, nearly. For this time I find from Peters' co-ordinates and the elements in the Berlin Jahrbuch.

$$(5)\cdots\quad \begin{aligned} \varkappa &= 0.47147 = L.\sin.1.''\operatorname{cosec}.\pi \\ L &= \text{least distance of centres in true orbit in seconds of arc.} \\ N &= 70^\circ\,11'\,10.''4 = \text{moon's orbital angle.} \\ \delta &= 19^\circ\,22'\,40.''3 = \text{moon's true declination.} \\ \alpha &= 52^\circ\,13'\,48.''2 = \text{moon's true R. ascension.} \\ \pi &= \quad 54'\,24.''1 = \text{moon's horizontal equatorial parallax.} \end{aligned}$$

The equations (2) and (4.) with the values in (5) give,

$$(6)\cdots\quad \begin{aligned} \Delta\alpha &= -1.''6794 - 0.1693 \times \Delta\pi \\ \Delta\delta &= -6.''3844 + 0.4436 \times \Delta\pi \end{aligned}$$

Calling the corrections of the moon's tabular longitude $\Delta\lambda$, Airy's formulæ, Greenwich observations for 1836, for changing $\Delta\alpha$ and $\Delta\delta$ into $\Delta\lambda$ and $\Delta\beta$, are,

*Bessel ibid. p. 140, omits the terms containing $\Delta\pi$ I have found it necessary to retain them in comparing together the results by the two methods.

(7)····
$$\Delta\lambda = \frac{P}{15}.\Delta\alpha + Q\Delta\delta$$
$$\Delta\beta = \frac{R}{15}.\Delta\alpha + S\Delta\delta$$

Also in his tables of these coefficients we find from the arguments α and δ in (5.)

(8)····
$$\frac{P}{15} = +\ 0.9147$$
$$Q = -\ 0.2440$$
$$\frac{R}{15} = +\ 0.2313$$
$$S = +\ 0.9690$$

and from (6,) (7) and (8,)

(9)····
$$\Delta\lambda = +\ 0.''0214 - 2.6311 \times \Delta\pi$$
$$\Delta\beta = -\ 6.''5740 + 0.3906 \times \Delta\pi$$

The mean of Rümcker's equations of condition from the observed beginning and end, at Altona, Hamburg, Copenhagen, Bremen, and Berlin, give,

(10)····
$$\Delta\lambda = -\ 2.''074 - 0.0630 \times \Delta'\beta + 0.0005 \times \Delta'(\odot + \mathfrak{D}) - 0.5849 \times \Delta'\pi$$
$$\Delta\beta = -\ 7.''630 + \Delta'\beta$$
$$\Delta(\odot + \mathfrak{D}) = -\ 1.'' \quad + \Delta'(\odot + \mathfrak{D})$$
$$\Delta\pi = \quad 0 \quad + \Delta'\pi$$

Where an accent over the Δ denotes a further correction of Rümcker's approximate values in (1.) The values of the corrections derived from the two computers in (9) and (10,) will coincide when we make,

(11)····
$$\Delta'\beta = +\ 1.474$$
$$\Delta'(\odot + \mathfrak{D}) = -\ 0.''112$$
$$\Delta'\pi = +\ 1.''069$$

Whence

(12)····
$$\Delta\lambda = -\ 2.''791$$
$$\Delta\beta = -\ 6.''156$$
$$\Delta(\odot + \mathfrak{D}) = -\ 1.''112$$
$$\Delta\pi = +\ 1.''069$$

The coincidence, of the results of these independent computations by methods wholly different, removes all probability of error in either. Bessel's method, however, appears more simple, inasmuch as the corrections of the place of the moon are reduced to two unknown quantities ε and ζ which are derived with greater facility and accuracy from the equations of condition, than the three unknown quantities $\Delta\lambda$, $\Delta\beta$, $\Delta\pi$, referred to in the old method. Accordingly I have adopted Bessel's method and Peters' corrections in reducing the American observations.

The importance of this eclipse for perfecting our geography, from the number and accuracy of its observations at home and abroad, is such that I have thought it useful to append a table of the final results from all the observations. Those from the European are taken from Peters' paper. Those from the American, were computed by myself first from Bessel's formulæ, Astr. Nachr. No. 152, and afterwards re-computed from Peters' co-

ordinates for the end, and mine for mean noon Berlin for the beginning. The second computations, however, gave no other change in the final results than that which arises from a change in the sun's mean semidiameter, which in Bessel's paper, No. 319, is derived from his reduction of the observations of the transit of mercury over the sun's disc in 1832, and is 1.″112 smaller than that which is derived from transit observations of the sun's limbs, which are believed to be affected by the irradiation of the telescope.

In the table below, m is the resulting longitude + east — west from Greenwich, affected by the errors of the elements in the Berlin Jahrbuch, the sun's semi-diameter being diminished 1.″112; a, b, and c, are the coefficients of the three principal corrections ε, ζ, and η or η'; so that d being the longitude corrected for these errors we have,

$$d = m + a\,\varepsilon + b\,\zeta + c\,\eta$$

It is found impossible to assign any value of η or η', which will satisfy all the observations, or even those made at the same place by different observers; indeed this value depends upon the size of the telescope, the power used, and the nice adjustment of the focal distance for the eye of the observer. Omitting this correction and making,

$$d' = m + a\,\varepsilon + b\,\zeta = m - 3.''650 \times a - 5.''472 \times b$$

we have the value of d' in the table below, which is the most probable longitude of the places of observation from Greenwich that can be deduced from this eclipse. I will here take occasion to remark that x in my former paper in vol. xviii. page 9. 1836. is equivalent to $a\,\varepsilon + \frac{1}{2}(b, + b')\,\zeta$ or to the half sum of corrections for the errors of the tables, for the beginning and end of the eclipse. The mean of the Philadelphia observations gave from an assumed longitude of 5h. 0m. 40s., a result which compares with Peters' correction as follows,

$x = -$ 11.04s. by my computations.
$x = -$ 10.60s. by Peters' "

a co-incidence which confirms the accuracy of the assumed longitude of the State House; indeed the mean of all the Philadelphia observations compared with the European, gives,

Longitude of State House = 5h. 0m. 39.6s.

To this result great weight should be attached; for we have five good observations of beginning and end here, and an ample number in Europe. I deem it proper in this place to add that the error of the three chronometers used at the Philosophical Hall, 100 South 8th street, and at T. M'Euen's house, were determined from comparison together immediately after the eclipse, and from my transit observations of the sun, and of stars in the evening following, checked by Eastern and Western altitudes of the sun, by two observers, Mr. Riggs and myself, with different sextants; the transit observations were corrected for instrumental deviations; so that the chronometers were not liable to an error of more than 0.4s. Mr. Sellers' observations were made with his own clock by Lukens, which has few superiors in any country, and its error was determined by Mr. Sellers' transit instrument by Young, and agreed with that furnished by my observations, after allowing for the difference of meridians.

The table of reduced observations, is here subjoined, the last column d' is the longitude from Greenwich, derived from the observation.

Place of observation.	Mean time of observation.	m	a	b	c	d'
	h m s					m s
Altona, *Schumacher* and *Son.*	2 43 50.8B	+39 53.18	+2·158	−0.112	+2.161	+39 45.92
	5 21 23.2E	+39 54.40	+2·159	−0.055	−2.160	+39 46.82
Apenrade, *Hansen* & *Fischer.*	2 40 38.4B	+38 17.43	+2·158	−0.021	+2.158	+38 9.67
	4 0 5.6BR	+37 57.78	+2·159	−0.063	+2.159	+38 50.25
	4 4 23.1ER	+37 50.87	+2·159	−0.094	−2.161	+37 43.50
Berlin, *Encke.*	3 2 43.8B	+53 41.91	+2·158	−0.181	+2.165	+53 35.03
	5 37 31.9E	+53 46.18	+2·160	−0.040	−2.160	+53 38.52
Bern, *Treschel.*	2 37 8.6B	+30.16.64	+2·158	−0.529	+2.222	+30 11.66
	5 16 48.2E	+29 49.47	+2·160	+0.342	−2.187	+29 39.72
Braunsburg, *Feldt* and *Becher.*	3 33 40.2B	+79 43.02	+2·158	−0.061	+2.159	+79 35.48
	4 49 23.6BR	+79 35.65	+2·159	+1.277	+2·508	+79 20.79
	4 52 34.2ER	+79 14.64	+2.159	−1·647	−2·715	+79 15.78
	6 1 40.1E	+79 20.91	+2.159	−0·214	−2·170	+79 14.19
Bremen, *Cluver* and *Wolf.*	2 38 12.0B	+35 18·41	+2.158	−0.102	+2.160	+35 11.09
	5 16 56.9E	+35 17.37	+2.159	−0.018	−2·160	+35 9.58
Bremerhafen, *Thulesius.*	2 37 27.0B	+35 0.63	+2.158	−0·109	+2·160	+34 53.35
	5 15 27.0E	+34 30.51	+2.159	−0·033	+2·160	+34 22.81
Brussels, *Quetelet.*	2 16 0.6B	+17 36.32	+2.158	−0·255	−2·173	+17 29.84
	4 59 47.3E	+17 37.49	+2.159	+0·152	+2·165	+17 28.78
Copenhagen, (Holken's, Bastion,) *Pedersen.*	2 55 52.8B	+50 31.21	+2.158	+0·010	+2·158	+50 23.28
	4 15 53.2BR	+51 2.76	+2.159	+3·580	+4·180	+50 35.29
	5 29 32.9E	+50 11.19	+2.159	−0·193	−2·168	+50 4.36
Copenhagen, (Round Tower) *Olufsen.*	2 56 3.7B	+50 39.89	+2.158	+0·011	+2·158	+50 31.96
	4 15 37.1BR	+50 49.02	+2.159	+3·618	+4·213	+50 21.35
	5 29 32.9E	+50 11.83	+2.159	−0·193	−2·168	+50 5.05
(*)	5 33 43.0E	+48 9.9	+2.160	+0·062	−2·160	+48 1.74
(†)	4 39 12.3E	+ 10.59	+2.159	+0·158	−2·165	+ 1.84
Halifax, *Waterhouse.*	1 39 8.0B	− 8 12.97	+2.158	−0·027	+2·158	− 8 20.69
	4 27 7.0E	− 8 14.57	+2.159	+0·043	−2·160	− 8 22.68
Hamburg, *Rümcker* and *Peters.*	2 44 6.3B	+40 5.25	+2.158	−0·112	+2·161	+39 57.99
	5 21 30.5E	+40 1.45	+2.160	−0·055	−2·160	+39 53.86
Hanover, *Lahmayer.*	2 43 49.0B	+39 7.64	+2.158	−0·183	+2·165	+39 0.77
	5 21 48.7E	+38 59.05	+2.159	+0·010	−1·159	+38 51.12
Jena, *Schrön.*	5 51 35.0E	+46 31.29	+2.160	+0·065	−2·161	+46 23.04
(‡)	3 36 19.2B	+82 8.81	+2.158	−0·040	+2·158	+82 1.16
	6 3 58.7E	+82 4.14	+2.159	−0·239	−2·173	+81 57.57
London, *Simms, jr.*	1 51 13.0B	+ 0.04	+2.158	−0·182	+2·165	+ 6.84
	4 38 47.0E	− 10.21	+2.159	+0·152	−2·165	+ 18.95
Louvain, *Crahay.*	2 17 37.3B	+19 18.65	+2.158	−0·249	+2·172	+19 12.16
	5 0 52.6E	+18 37.29	+2.159	+0·147	−2·164	+18 28.61
Makerstown, *Brisbane.*	1 36 51.2B	− 9 39.71	+2.158	+0·081	+2·159	− 9 48.02
	3 1 4.2BR	− 9 35.22	+2.158	+0·143	+2·163	− 9 43.88
	3 5 11.6ER	− 9 55.48	+2.158	−0.129	−2·162	−10 2.69
	4 23 0.6E	− 9 54.45	+2.159	−0.056	−2·160	− 10 2.02
Neumühlen, *Zahrtman.*	2 43 54.4B	+39 55.85	+2.158	−0.112	+2·161	+39 48.60
	5 21 20.6E	+39 51.86	+2.159	−0.055	−2.160	+39 44.28
Neustrelitz, *Lorentz* & *Becker.*	3 0 28.0B	+52 32.86	+2.158	−0.130	+2.162	+52 25.70
	5 34 58.0E	+52 19.40	+2.160	−0.079	−2.161	+52 11.95

*Gera, *Metz* and *Engelhardt.*
†Greenwich, *Airy* and four others.
‡Königsberg, *Bessel, Son* and *Busch.*

Place of observation.	Mean time of observation.		*m*		*a*	*b*	*c*		*d'*	
	h m s		h m s							
Pillau,	4 49 56.5BR	+	79 57.09		+2.159	+2.533	+3.328	+	79	35.35
Schwink.	4 51 57.6ER	+	79 24.73		+2.159	−3.117	−3.791	+	79	33.91
Rostock,	2 54 43.1R	+	48 36.43		+2.158	−0.083	+2.159	+	48	29.01
Karsten.	2 14 19.7BR	+	48 36.18		+2.159	−1.965	+2.919	+	48	39.05
	4 17 58.2ER	+	48 48.45		+2.159	+1.596	−2.684	+	48	31.85
	5 29 58.2E	+	48 33.24		+2.159	−0.107	−2.162	+	48	25.95
(*)	1 51 52.1B	+		27.40	+2.158	−0.185	2.165	+		20.54
	4 39 20.1E	+		16.66	+2.159	+0.158	−2.165	+		7.92
Steltin,	3 7 51.7B	+	58 22.61		+2.158	−0.126	+2.161	+	58	15.43
Dancke.	5 41 16.3E	+	58 23.51		+2.160	−0.101	−2.162	+	58	16.18
Stralsund,	2 59 44.2B	+	52 40.02		+2.158	−0.071	+2.159	+	52	32.54
Sielnort.	4 18 7.0BR	+	52 24.17		+2.159	−0.865	+2.325	+	52	21.03
	4 22 26.6ER	+	52 33.00		+2.159	+0.613	−2.244	+	52	21.77
	5 33 49.2E	+	52 27.62		+2.159	−0.103	−2.163	+	52	20.30
Strasburg,	2 36 45.1B	+	31 15.48		+2.158	−0.419	+2.198	+	31	9.90
Herrenscheider.	5 16 44.9E	+	30 53.41		+2.160	+0.243	−2.173	+	31	44.20
Fondern,	2 37 15.0B	+	35 37.44		+2.158	−0.026	+2.158	+	35	29.71
Petersen.	3 57 26.7BR	+	35 37.16		+2.159	−0.387	+2.195	+	35	31.38
	4 1 48.1ER	+	35 35.29		+2.159	+0.229	−2.171	+	35	26.16
	5 14 51.0E	+	35 32.60		+2.159	−0.117	−2.163	+	35	25.36
(†)	5 54 37.1E	+	65 36.52		+2.160	+0.148	−2.165	+	65	27.82
(‡)	2 47 4.0B	+	39 52.34		+2.158	−0.337	+2.184	+	39	46.30
	5 32 40.0E	+	47 40.87		+2.160	+0.053	−2.160	+	47	32.69
Washington, (Capitol,) *Hassler.*	18 53 58.0B	−	5 7 53.26		+2.157	+1.242	+2.489	−	5 8	7.92
	21 20 8.0E	−	5 8 12.46		+2.158	−0.252	−2.172	−	5 8	18.99
Haverford Pa,	19 3 24.5B	−	5 0 51.82		+2.157	+1.232	+2.484	−	5 1	6.43
I. Gummere.	21 31 47.0E	−	5 1 17.12		+2.158	−0.249	−2.171	−	5 1	23.67
Germantown,	19 3 55.5B	−	5 0 23.65		+2.157	+1.229	+2.482	−	5 0	38.25
C. Wistar.	21 32 49.5E	−	5 0 34.66		+2.158	−0.232	−2.170			41.26
Germantown,	19 3 54.5B	−	5 0 24.77		+2.157	+1.229	+2.482			39.37
I. Lukens.	21 32 44.5E	−	5 0 38.18		+2.158	−0.232	−2.170			44.78
§State House,	19 3 38.0	−	5 0 25.41		+2.157	+1.227	+2.481	−	5 0	39.99
Phila. *T. M'Euen.*	21 32 38.1			33.20	+2.158	−0.252	−2.171			39.82
State House,	19 3 50.0			13.14	+2.157	+1.226	+2.481			27.72
W. H. C. Riggs.	21 32 26.5			41.43	+2.158	−0.232	−2.170			48.04
State House,	19 3 40.9			24.66	+2.157	+1.225	+2.481			39.24
S. C. Walker.	21 32 44.1			30.86	+2.158	−0.228	−2.170			37.48
State House,	19 3 45.8			20.42	+2.157	+1.225	+2.481			34.90
R. M. Patterson.	21 32 38.3			35.93	+2.158	−0.229	−2.170			42.57
State House,	19 3 41.0			25.00	+2.157	+1.225	+2.481			39.47
S. Sellers.	21 32 34.0			39.46	+2.158	−0.229	−2.170			46.80
(¶)	19 12 48.5	−	4 53 12.11		+2.157	+1.203	+2.451	−	4 53	26.66
	21 43 40.0	−	4 53 50.70		+2.158	−0.206	−2.170	−	4 53	57.45
Southwick, Mass.	19 17 52.2	−	4 50 51.99		+2.157	+1.226	+2.463	−	4 51	6.53
Holcomb.	21 49 20.1	−	4 51 13.36		+2.158	−0.231	−2.170	−	4 51	19.97

*Shooter's Hill, *Hodgson, Simms, jr., Simms, sen.* and *Gilby.*

†Vienna, *Hallaschka, J. J. Littrow, C. J. Littrow, Böhn, Brestel.*

‡Wurtzburg, *Schoen, J. Zeitz.*

‖The observation at Pillau is affected with the clock's error.

§The values of *m* and *d'* for the Philadelphia observations are reduced to the State House.

¶West Hills, (Coast Survey,) *Ferguson.*

§A highly interesting memoir on a remarkable phenomenon which occurs in total and annular eclipses, by Francis Bailey, Esq., Vice President of the Royal Astronomical Society, has been published in the 10th volume of the memoirs of that society. I have appended an extract from this memoir, describing this phenomenon as observed by Mr. Bailey, at Inch Bonney, Lat. 55° 27′ 30″, Long. 10m 12s.0 west of Greenwich, situated in the path of the centre of the annular eclipse of May, 1836. For the early receipt of a copy of this memoir from the author, I am indebted to the attentions of Prof. Alex. Dallas Bache. It is hoped that the annular eclipse of Sept. 18th, 1838, will, if the weather permits be observed with reference to the phenomenon described by Mr. Baily. The city of Washington, near its central path, will afford an excellent position for observation. The computations of R. T. Paine Esq., in the American Almanac, or the formulæ for the announcement of its principal phases with the geographical limits of the annular phase, in E. O. Kendall's paper published in the Journal of the Franklin Institute vol. xx p. 125, will serve as a guide to observers in the choice of a favourable position. The last annular eclipse of the sun observed at this place was by Rittenhouse, April 3rd, 1791. From inspection of Mr. Paine's list of eclipses for the rest of the century, in the American Almanac for 1831, pages 70 to 76, it does not appear that any other annular eclipse will occur at this place in the 19th century.

1. *On a remarkable Phenomenon that occurs in Total and Annular Eclipses of the Sun. By* Francis Bailey, Esq., *Vice-President of this Society, &c. &c.*

The following are the observations as shewn by one of the chronometers, adjusted, from a mean of all the comparisons, to the correct mean time at Inch Bonney.

Beginning of the eclipse	1h	36m	44s	
Formation of the annulus	3	0	57	} subject to discussion.
Dissolution of the annulus	3	5	23	} See page 159.
End of the eclipse	4	23	7	

The diminution of light was not so great, during the existence of the annulus, as was generally expected; being little more than might be caused by a temporary cloud passing over the sun: the light however was of a peculiar kind, somewhat resembling that produced by the sun shining through a morning mist. The thermometer in the shade fell only about three or four degrees: it was 61° during the time of the annulus. About twenty minutes before the formation of the annulus, *Venus* was seen with the naked eye: and a few minutes afterwards I found it impossible to fire gunpowder with the concentrated rays of the sun through a lens of three inches in diameter. The same lens likewise had no effect on the bulb of a thermometer, during the existence of the annulus. Similar results also were obtained by Sir Thomas Brisbane.

As preceding writers have noticed the tendency of the birds of the field and of the poultry, to go to roost during the darkness occasioned by a great eclipse, I would here remark that nothing of the kind occurred on this occasion in the district where I was placed.* On the contrary the birds in the hedges were in full song during the whole time of the eclipse: and I noticed to Mr. Veitch that one cock in particular, in a neighbouring farm-yard

*This supposed *darkness* has always been overrated, even in total eclipses. The light which remains, after the sun is wholly covered, is sometimes as great as that of the *full moon*.

was crowing with all his might, whilst we were observing the remarkable phenomenon of the annulus.

Having made these general remarks I shall now proceed to detail those singular appearances which occurred at the formation and dissolution of the annulus; and which have never yet, as far as I have been able to ascertain, been described in a complete and connected manner, in any preceding accounts. For, although detached portions of the phenomenon have been recorded by different observers, as seen at different places, yet it is impossible, from those descriptions, to form an accurate idea of the *whole*, or to trace the origin, progress, and termination of that remakable phenomenon which immediately precedes the complete formation of the annulus, and which again takes place (but in an inverse order) immediately after the commencement of the dissolution of the annulus. In fact, since the phenomenon itself, during its short period of existence, constantly varying in some minute particulars, no description of any one detached portion of it will enable us to judge of the remainder: and thus the partial accounts of different observers (alluding probably to different stages of the phenomenon) become confused and perplexing.

The weather at Inch Bonney was remarkably favourable for observation: the sky was perfectly clear and serene; not a cloud to be seen in any part of the heavens, during the whole time of the eclipse. When the last portion of the moon's disc was about to enter on the face of the sun, I prepared myself to observe the formation of the annulus. I was in expectation of meeting with something extraordinary; but imagined that it would be momentary only, and consequently that it would not interrupt the noting of the time of its occurrence. In this, however, I was deceived, as the following facts will shew. For when the cusps of the sun were about 40° asunder, a row of lucid points, like a string of bright beads irregular in size and distance from each other, *suddenly* formed round that part of the circumference of the moon that was about to enter, or which might be considered as having just entered, on the sun's disc. Its formation indeed was so rapid that it presented the appearance of having been caused by the ignition of a fine train of gunpowder. This I intended to note as the correct time of the formation of the annulus, expecting every moment to see the thread of light completed round the moon; and attributing this serrated appearance of the moon's limb (as others had done before me) to the lunar mountains, although the remaining portion of the moon's circumference was comparatively smooth and circular, as seen through the telescope. (See fig. 1.) My surprise however was great on finding that these luminous points, as well as the dark intervening spaces, increased in magnitude, some of the contiguous ones appearing to run into each other like drops of water: for, the rapidity of the change was so great, and the singularity of the appearance so fascinating and attractive, that the mind was for the moment distracted, and lost in the contemplation of the scene, so as to be unable to attend to every minute occurrence. Finally, as the moon pursued her course, these dark intervening spaces (which, at their origin, had the appearance of lunar mountains in high relief, and which still continued attached to the sun's border) were stretched out into long, black, thick, parallel lines, joining the limbs of the sun and moon; when, all at once, they *suddenly* gave way, and left the circumferences of the sun and moon in those points, as in the rest, comparatively smooth and circular; and the moon perceptibly advanced on the face of the sun. This moment, therefore, may, by some persons, be considered as the complete formation of the annulus, and has, I believe, in

most cases, been recorded as such: but I shall state my reasons presently why I think this should not be assumed as the true moment of the astronomical phenomenon.

Fig. 1

Fig. 2

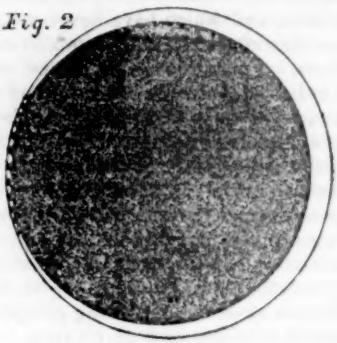


Fig. 3

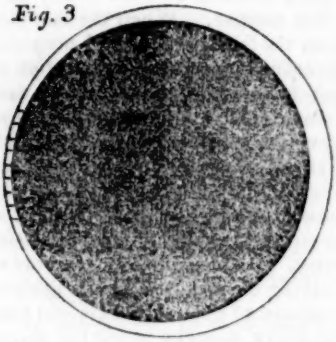
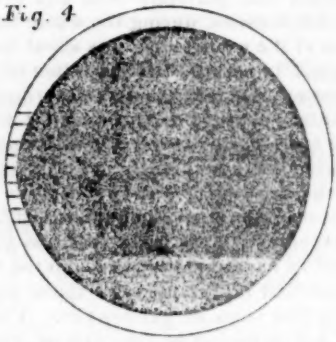


Fig. 4



The appearances here recorded passed off in less time than it has taken me now to describe them; but they were so extraordinary and so rapid, that all idea of time was lost, except by the recollection afterwards of what had passed: for, I was so riveted to the scene, that I could not take my eye away from the telescope, to note down any thing, during the *progress* of this phenomenon. I estimate, however, that the whole took up about six or eight seconds, or perhaps ten at the utmost. In the plate annexed to this memoir, I have endeavoured to delineate the several phases above mentioned, in three of its most striking stages. Fig. 1 represents the first appearance of the luminous string of beads just formed round the edge of the moon; which was almost instantaneous. Fig. 2 represents a *continuation* of the same phenomenon, or the moon further advanced on the face of the sun, but still apparently adhering to its border by means of the dark, thick, irregular spaces which separate the luminous portions, now become somewhat enlarged in size. Fig. 3 represents still a *continuation* of the same phenomenon; the dark parts being now stretched out into long, black, lines which seemed to connect together the limbs of the sun and moon; and are here represented as they appeared immediately before their sudden rupture, and total disappearance. In all these representations on the plate, the moon is supposed to be proceeding in a horizontal direction, from the

left hand towards the right. I cannot describe these phenomena (or rather this phenomenon, for it was one *continuous* appearance) more correctly, than by supposing, for the moment, that the edge of the moon was formed of some dark glutinous substance, which by its tenacity adhered to certain points of the sun's limb, and by the motion of the moon was thus drawn out into long threads, which suddenly broke and wholly disappeared.

After the formation of the annulus thus described, the moon preserved its usual circular outline during its progress across the sun's disc, till its opposite limb again approached the border of the sun, and the annulus was about to be dissolved. When, all at once, (the limb of the moon being at some distance from the edge of the sun) a number of long, black, thick, parallel lines, exactly similar in appearance to the former ones above mentioned, *suddenly darted forward* from the moon and joined the two limbs as before: and the same phenomena were thus repeated, but in an inverse order. For, as these dark lines got shorter, the intervening bright parts assumed a more circular and irregular shape, and at length terminated in a fine curved line of bright beads (as at the commencement) till they ultimately vanished, and the annulus consequently became wholly dissolved.

The time employed in this act of dissolution (if I may so express myself) was about the same as that at its formation: but the rapid and progressive change in the appearances, and their striking character, so riveted my attention again, that I am unable to speak more decidedly on the time occupied, than on the first occasion. The same reason also prevents me from stating the precise number of the dark lines: I should think however that they were not fewer than six nor more than ten. The impression on my mind, from recalling all the circumstances to my recollection, is that there were about eight. They were as plain, as distinct, and as well defined, as the open fingers of the human hand held up to the light.

For the cause of this optical deception I shall not attempt to account. That it does not depend on the instrument employed, or on the eye of the observer, would appear from the concurring testimony of those who witnessed the phenomenon, at various places and with different telescopes, and who yet agree in the main facts here stated. The account given by Veitch, who used a 30-inch refractor, coincided exactly with my own, as compared immediately after the termination of the annulus. The description also by Sir Thomas Brisbane, who used a 2-feet reflector, and whom I visited immediately after the eclipse, agreed in all the essential particulars, and differed only in those points on which I had myself some doubt. Mr. Henderson also, who observed the eclipse at Edinburgh with a $4\frac{1}{2}$-feet refractor, noticed appearances very similar to those which I have here described.

I have been the more particular in making these remarks from having observed that in no one of the published accounts which I have yet seen of this eclipse, is any special notice taken of the remarkable phenomena above alluded to: although, as I shall presently shew, those phenomena, being seen under different circumstances at different places, must materially affect the astronomical results. Or, if any notice has in some instances been taken, the allusion is so slight (being confined principally to the formation of the string of luminous beads, at the very commencement of the annulus,) that few readers would suspect that any thing further remarkable had occurred. I cannot account for this general reluctance to record so singular a phenomenon as that of the dark lines, which

I apprehend could not possibly have passed unobserved by any astronomer.

There is, however, another extraordinary phenomenon, usually accompanying annular eclipses, of a totally different kind from that just described and arising from a totally different cause; and which takes place immediately before the whole body of the moon is projected on the face of the sun. I allude to the arch of faint light, or rather to the luminous edge, which encircles that portion of the moon's border that is *off* the sun's disc. This has been seen on several occasions, as I shall more fully detail in the following pages; but I must confess that I did not myself observe this phenomenon in the present eclipse: a circumstance owing, in the first place, to my attention not having been specially directed to it; and secondly, to my whole time being occupied in looking out for the distinct formation of the annulus. So many interesting objects indeed are crowded into such a short space of time, just at that instant, that there is no opportunity of noting down appearances during their actual occurrence: and the memory must be taxed afterwards for the recollection and description of minute details.

I have already stated that, from the accounts given of preceding annular eclipses, I was led to expect some extraordinary appearances. To those accounts I shall now more particularly refer, not only as confirmatory of what I myself observed on this occasion, but also to shew the imperfect manner in which the phenomenon has been hitherto described, as well as the variety of forms it may assume according to circumstances either accidental or local. For, the position of the spectator, with respect to his distance from the central line, will doubtless cause a difference in the formation, progress, and whole appearance of the phenomenon. A person placed just within the limits of the moon's umbra would probably not witness any of the dark lines to which I have so frequently alluded: but the border of the moon, which in such case just grazes the edge of the sun, would perhaps have a serrated appearance, like lunar mountains of extraordinary height and magnitude; for which indeed they might be readily mistaken at first sight: or would perhaps exhibit only the luminous string of beads, or broader luminous spaces, throughout the whole progress and existence of the annulus. And thus we might have, from this almost imperceptible and unobservable annular appearance, all the intermediate grades up to the extraordinary phenomenon which I have above described. Intervening clouds likewise, just at an unfortunate moment, may in some cases have prevented a full and connected view of each minute occurrence: a circumstance which may in some measure account for the partial and imperfect statements which have hitherto appeared. And I cannot but consider myself as extremely fortunate in having experienced so fine a day for witnessing the whole of the phenomena which I have here recorded.

Before I quit this part of the subject, I wish here to place also on record the appearances which the body of the moon presented during the existence of the annulus. Previous to the formation of the ring, the face of the moon was perfectly black; but on looking at it, through the telescope, *during the annulus*, the circumference was tinged with a reddish purple colour, which extended over the whole disc, but increased in density of colour according to the proximity to the centre; so as to be in that part nearly black. At the same time the globular form of the moon was very perceptible. Mr. Veitch noticed the same circumstances; and we both agreed that the moon

had the appearance of a *globe* of purple velvet. No coruscations were visible on the darker parts, as noticed on former occasions by different observers. During the annulus, being very near sighted, I could not perceive the moon on the face of the sun, with my naked eye: but to Mr. Veitch and others it was distinctly visible.

It is not known at the present day whether, in the annular eclipses of 1736-7, 1748, and 1764, or even in the recent annular eclipse of May last, the times of the moon's total ingress on the sun's disc, be reckoned from the moment when the moon's circumference appears to osculate with that of the sun, or from the moment when the dark lines are seen to part asunder. I believe that most observers have assumed the latter as the most certain and best determined instant of time; although it seems to me not to be the correct moment of the astronomical phenomenon: the former is in my opinion as easily determined if the observer would prepare himself for noting it, and certainly approximates most nearly to the correct time. My own record of the formation and dissolution of the annulus, in page 154, refers to the point of time here alluded to; namely, when the limb of the moon osculated with that of the sun, as nearly as I could estimate and call to mind, amidst the rapid succession of interesting phenomena; and which I consider to be simultaneous with the formation of the luminous string of beads. Both instants, however, ought to be recorded, as in the case of the transits of *Venus:* and in future annular eclipses (as well as in total ones) I trust that this will be attended to. But, the interposition of clouds will sometimes frustrate the best intentions.

This precaution will be the more necessary, since it is plain that the appearances will be different to different observers, according to their local position with respect to the central line of the moon's shadow; as I have already noticed in the preceding part of this paper. And I know some persons who did not notice the dark lines in the late eclipse, although furnished with good telescopes, and favourably situated. This brings me to another portion of the subject to which I have not alluded, namely the distortion of the moon's circular shape: for, hitherto I have considered the phenomenon as remarkable only for certain filaments or projections from the moon's limb, without supposing that the general circular form of the moon was disturbed. In the case of the transit of *Venus*, we have seen that the disc of the planet, next to the edge of the sun, was sensibly protuberant, and that the form of the planet was thus rendered more like that of an egg, than a circle. The same cause that produced this apparent distortion of *Venus*' disc, might also produce a similar distortion in that of the moon; but, by reason of the magnitude of the moon's disc, and the field of the telescope not embracing the whole, it would not be so easily perceptible. There was one circumstance, however, connected with this subject, which I noticed during the late eclipse, that induces me to think that such a distortion did take place on that occasion, and which I shall now proceed to describe.

If we examine the relative curvatures of the circles in fig. 3, which represent the discs of the sun and moon, and note their proximity to each other, it will be seen that there can be no very perceptible difference in the apparent length of the parallel lines, which there denote the dark ligaments so frequently alluded to in this paper, provided those curves truly represented the apparent disc. But, in fact, the outer lines immediately before their rupture seemed to be nearly twice the length of those in the middle, which could arise only from some distortion of the moon's apparent

limb, and of a kind similar to that which had been observed in *Venus*. I have endeavoured to represent this appearance in fig. 4: and if my notion be correct, it will shew us that all measures of the moon's diameter, when she is passing over the sun's disc, must be taken with great caution and with due attention to the proximity of the part measured to the edge of the sun's disc, where alone the distortion seems to take place.

This hypothesis of a distortion of the moon's circular form seems to receive confirmation from a circumstance attending her motion across the sun's disc, when she is *wholly* thereon, which has been noted in annular eclipses by several observers: namely, that at the time of ingress and egress, her motion appears more rapid than at any other point. This apparent increase of motion would arise from the subsidence of the protuberance in the first instance, and from its projection in the latter case.

Another singular anomaly also may arise, from this view of the subject. It is possible that in a small annular eclipse (that is, an eclispe where the apparent diameter of the moon, as computed from the tables, is but a few seconds less than the apparent diameter of the sun) the observer may be so exactly placed on the central line as to see the eclipse *total*, for a moment of time. For, as each portion of the moon's circumference would at the instant that it was concentric with the sun's) protrude, and adhere to that of the sun, the spectator would witness a total eclipse *sine mora*, when in fact he ought only to see an annular one.

It is very probable that the accounts of the appearance of great lunar mountains and valleys which we so frequently hear of in the descriptions of solar eclipses, may be traced to the same cause, as that which produces the phenomena above alluded to. These prodigious elevations and depressions are seldom or never seen except at the commencement or termination of the eclipse, or in places near the solar cusps; that is, in those points only which are near the edge of the sun. Every other portion of the moon's circumference generally appears comparatively smooth and circular, except viewed with a very powerful telescope; whilst with a much inferior instrument we may frequently detect inequalities in those parts of the moon's circumference which successively come in contact with the sun's limb.

This brings me to the consideration of another subject connected with the present inquiry. It has, I believe, been generally supposed that, in eclipses of the sun, the measurement of the distances of the solar *cusps* affords one of the best means of determining the beginning and ending of the eclipse: and, if those cusps always presented a finely pointed apex, this would undoubtedly be the case. But, it is frequently found that the cusps are rounded, or serrated, or broken into parts, and consequently that we cannot obtain the correct measures between the *true points* of the cusps. For which reason we oftentimes meet with discordances in such measures, that have hitherto baffled all attempts at explanation; but which may be fairly attributed to the causes above alluded to. I do not wish however to be considered as objecting to this mode of determining the phases of an eclipse, which, after all, is probably one of the best: but merely as wishing to place the observer on his guard, and to enable him to trace the source of error, should he meet with any of the discordances above mentioned.

It is clear that, before we can deduce the most accurate and accordant results from the observations of annular eclipses, we must have further information on these points, and we must agree on the particular stage of the phenomenon, when the annulus shall be considered as formed, or dissolved: and after all, there will probably still remain some discrepancies arising from the distortion of the moon's limb according to the geographi-

cal position of the spectator. The subject, however, is worthy the consideration of astronomers; and ought not to be neglected at any ensuing solar eclipse that may afford facilities for determining these points.

Franklin Institute.

REPORT OF THE COMMITTEE ON METEOROLOGY.

Report of the Committee on Meteorology to the Board of Managers of the Franklin Institute, embodying the facts collated by the Meteorologist relative to the storm of the 16th, 17th and 18th March, 1838.

As the great storm immediately preceding the Vernal equinox of the present year was one of that class which is supposed to stretch over a wide extent of territory, and to traverse the globe with a determinate direction and velocity, it was believed that an accurate knowledge of its progress and violence at different points would not only prove highly interesting to the cultivators of Meteorological knowledge, but would also tend much to the promotion of the object for which the committee was appointed; with this view the late Joint Committee on Meteorology, of the American Philosophical Society and of the Franklin Institute, issued two hundred and fifty circulars to different parts of the United States and to Canada, asking for information on the various phenomena exhibited by the storm in the respective vicinities.

That the persons addressed might know the precise objects which the committee had in view, it was stated in the circulars, that the committee regarded it as highly important to ascertain the phases of the great storms of rain and snow which traverse our continent, their shape and size, what direction, and with what velocity their centres move along the surface of the earth, whether they are round, oblong, or irregular, in their shape, whether they move in different directions in the different seasons of the year, &c. &c.

To this circular between forty and fifty answers have been received, furnishing a mass of information highly useful and interesting.

These communications were placed in the hands of the Meteorologist for collation, which duty he has performed, as will be seen by his report annexed.

Robley Dunglison, M. D.
Alexander D. Bache,
James P. Espy,
Charles N. Bancker,
John K. Kane,
Henry D. Rogers,
Sears C. Walker,
R. M. Patterson, M. D.
John C. Cresson,
Gouv. Emerson, M. D.

Philadelphia, July, 9th 1838. Committee on Meteorology.

TO THE COMMITTEE ON METEOROLOGY OF THE FRANKLIN INSTITUTE.

GENTLEMEN:—The following facts comprise some of the most important details collected from the various correspondents. These with additions from other sources are arranged and numbered so as to commence in the Westward, and progress towards the Eastward.

Franklin La. (S. W. of New Orleans,) 29° 50′ N. 91° 50′ W. (From our regular correspondent, a lady.)

Beyond the storm. On the 16th, 17th, 18th and 19th of March, the wind was constantly from the N. high in the mornings, light in the evenings, except the 19th, when it was light in the morning. Clear from the 14th till the afternoon of the 22nd. Slight frost on the 18th and 19th. Barometer rose from the 16th 30.20, till the 17th 30.30, and remained at that till the 20th when it fell again to 30.20.

2. U. S. Hospital, Baton Rouge, La. 30° 29′ N. 91° 27′ W. Observed by W. R. HEIPERS, and communicated by A. WADDEIR, Esq.

There was no storm here on the 16th and 17th of March, which were clear fine days, wind strong from N. E. 18th fine clear day, frost, wind light N. W. 19th wind N. W. strong, cloudy.

3. Natchez, Miss., 36° 34′ N. 91° 25′ W. (From our regular correspondent, HENRY TOOLEY, Esq.)

March 16th hazy, but without a cloud, wind	N.		2	3	6	
17th hazy, very clear "	N. W.		2	3	4	2
18th not a stain on the ethereal blue,	N.		2	W	1	
19th thick haze.	S.		2	SW.	2	1

Barometer on the 16th	29.91
17th	30.03
18th	30.05
19th	29.95

4. Jackson, Miss., 32° 25′ N. 90° 8′ W. (Communicated by the Postmaster.)

There was no rain here from the 11th of March till April.

March 16th, wind's direction and force	N.	2	6	3	
17th,	NW.	2	3	4	2
18th,	N.	2	W.	1	
19th,	S.	2	SW.	1	

5. U. S. Frigate Constellation, Pensacola Bay, lat. 30° 23′ 40″ N., long. 87° 12′ W. (Observed by Dr. HULSE, and communicated by J. H. C. COFFIN, Esq.)

This place was beyond the borders of the storm. On the 16th, 17th and 18th of March, the wind was from WNW. to N. and NW. constantly; generally moderate weather; clear, with haze in horizon.

On the 19th the wind was NW. till noon, changeable P. M. to southwardly.

6. Huntsville, Alabama, 34° 36′ N., 86° 57′ W. (From JOHN ALLAN, Esq.)

We had no storm here at the time mentioned. On the 15th, 16th, 17th and 18th of March, the wind was moderate from the NW. Weather cloudy, with the exception of the 18th, which was clear. On the 19th the wind in the morning was a stiff breeze SE., the remaining part of the day SW.

7. Nashville, Ten., 36° 10′ N. 86° 49′ W. (From our regular correspondent, Morgan W. Brown, Esq.)

March 14th, some rain, with change of wind from S. and SW. to NW.

15th, cloudy, clouds passing from N. with moderate wind.

16th, cloudy, with slow rain in forenoon, and occasional showers in the afternoon, mixed with sleet—clouds passing from NW. with brisk wind; becoming colder.

17th, Clouds passing from NW. and N., with brisk wind from NW., partially clear at sunset and after night.

18th, clear, except cirri to E. in the morning, which soon passed off in that direction; wind brisk throughout the day NW.; calm at night.

8. Grayville, Illinois. (From James Gray, Esq.)

The weather here on the 16th, 17th, 18th and 19th, was good, except that there may have been a little rain. The wind was, during that time, too gentle to be observed, and therefore I cannot say from what quarter it came.

9. Warren Court House, Illinois, on the Mississippi river, pretty high up, 40° 50′ N., 90° 50′ W. (From Daniel McNeily, Esq., P. M.)

We had no storm here. The sky was remarkably clear, and fine weather on the days mentioned, if our memory serves us. On the night of the 15th we had a little snow, and for a few days after a light wind from NW.

10. Logansport, Ind., (near northern part of the state,) 40° 53′ N., 86° 22′ W. (From D. D. Pratt, Esq.)

On the 16th, 17th, 18th and 19th of March, the weather here was remarkably fine and warm, and continued so till the 8th of April.

I recollect, however, on the night of the 15th, and during the forenoon of the 16th, a heavy damp snow fell to the depth of several inches, accompanied with a strong wind. I was riding down the Wabash in a direction a little south of west, and I think the wind was blowing nearly in my face. It might have been from a point 25° or 30° south of west.

11. Elizabethville, Harrison county, Ind. (From E. H. Compton, Esq., observed by John Low, Esq.)

March 16th, got up before sunrise, found a rainy morning, which early in the day changed to snow, and was attended with the severest storm felt here this season. The snow, notwithstanding the dampness of the ground, fell three or four inches deep. The storm continued till I went to bed at 8, P. M.; wind from the NNW., the point from which it blew all day.

17th, left my bed at day break, found it still cloudy, with considerable wind. It was partially clear through the day, and the wind came round to NNE.

18th, at day break, found it clear, but somewhat cold; moderated, became pleasant, and remained so all day, and wind changed to ESE., quite calm.

12. Lexington, Ky. 38° 6′ N., 84° 18′ W. (From our correspondent, Prof. Robert Peter.)

	Bar.	Bar.	Bar.	Ther.			
March 16th,	29.02	28.97	29.00	45°	41°	36°	Rain, sleet, wind very high in the night NW.
17th,	28.86	29.00	29.02	30	34	36	Snow, windy, N. winds at night.

	Bar.	Bar.	Bar.	Therm.			
18th,	29.01	29.02	29.02	36	50	40	Clear, more clear.
19th,	28.98	28.88	28.85	40	65	57	Hazy, clear.

Rain 0.05 on night of the 15th.
" 0.40 on " 16th.
" 0.10 on " 17th.

Whole amount, 0.55 of an inch.

The wind, if my recollection serves me, was at its height on the night of the 16th, NW., and was still high on the 17th, N.

13. Wilmington, O. (a little north from Cincinnati,) 39° 30′ N., 84° 53′ W. (From A. Jones, M. D., by Hon. P. G. Goode.)

It commenced raining at noon on the 13th of March, and continued rainy until noon of the 16th, at which time it snowed and rained alternately. But a small quantity of rain fell. On the 17th, snow from a half to one inch deep. The wind on the 16th, 17th, 18th and 19th, was NW., and a good part of the time a strong current. On the 17th and 18th, very strong current NW.W. The morning of the 18th was clear, and continued so till the 23d, at night, when there was a slight rain.

Troy, O., (80 or 90 miles N. of Cincinnati.) (From John G. Talford, Esq.)

On the night of the 16th of March, and also on the night of the 17th, we had a slight fall of rain and snow, (mixed.) The 18th was a clear, warm, and pleasant day, and I find noted, the honey bee out this day for the first time. On the 16th the wind was NW., not strong; and on the 17th and 18th it was N., gentle. The thermometer ranged from 26° to 70°.

14. Springfield, O., 39° 30′ N., 84° 50′ W. (From our regular correspondent, M. G. Williams, Esq.)

Began to rain at 6½ A. M. of the 16th March, changed to snow at 9, and terminated at night, 0.23 inch of water. Wind all day at N. 2, clouds NNW. 2. On the 15th the wind was NW. 3–2 all day, and on the 17th it was NW. 3 at 7 A. M., and at 2 P. M., NNW. 4; clouds N. 2, and at sunset NNW. 3; cloudy all day. 18th, clear; wind all day NNW. 2–3–1. The barometer was, on the 15th, 28.95, and fell to 28.86 on the morning of the 17th, at which it stood all day, and rose again on the 18th to 28.90, but fell very rapidly on that day to 28.63.

15. Greenfield, Ind., (near the middle of the state,) 39° 53′ N., 85° 52′ W. (From our regular correspondent, David Alter, Esq.)

March 15th, cloudy; light breeze from NW. and occasionally a sprinkle of rain. 16th, breeze from the N. and some snow falling. 17th, clear, strong wind from N. 18th, clear, light breeze from N.

Rome, Ind., 37° 58′ N. 86° 32′ W. (60 miles SW. of Louisville.) (From Samuel Frisbie, Esq.)

We had no storm of rain or snow during the days named. Indeed, previous to the 6th of April, we had no rain for a long time, and the Ohio bottoms became very dry and hard to plough. I must say, however, I took no note of the weather, and I rely solely on my recollection.

16. Washington, Michigan. (From D. Cooley, Esq., P. M.)

March 15th, cloudy. 16th, snowed moderately through the day; amount

of snow two inches; wind brisk from NE.; clear at 9, P. M. 17th, 18th and 19th, clear; wind not noted.

Centreville, Michigan, (Southern part of the state, and nearer the west than the east.) (Observed by Wm. Connor, Esq., communicated by J. W. Lawley.)

March 16th, at 4½, A. M., commenced snowing, heavy wind NW.—cold—at noon stopped snowing; depth of snow two inches. The 17th, clear and pleasant; snow gone at noon. 18th, clear and warm. 19th, thermometer 66° in the shade.

17. Western Reserve College, Hudson, O., (NE. corner.) (From our correspondent, Prof. Elias Loomis.)

March 15th, dense drizzling fog, wind faint from NW. 16th, wind light from NW. to NNW., with some snow and drizzling. 17th, wind fresh in the morning, strong in the afternoon from N., varying from about NNW. to NE., (March wind.) 18th, perfectly clear and bright; wind light from NNW. to N. The barometer was nearly stationary on the 16th and 17th, at about 28.86; on the 18th it fell to 28.79, and on the 19th to 28.47.

18. Jefferson, N. C., (Northwest corner of the state,) 36° 30′ N., 81° 20′ W. (From R. Murchison, Esq.)

The storm commenced here some time in the night of the 15th of March, with rain strongly driven by W. and NW. winds, and terminated on the 18th in the afternoon. The wind blew with little variation from W. and NW. much of the time with great velocity.

There was considerable rain on the night of the 15th and on the morning of the 16th; and about noon on that day a furious storm of snow commenced that continued till about (or a little before) 12, M., on the 18th. The whole of the 17th was the most constant and violent snow storm I ever saw to continue so long.

It is difficult to state the precise depth of the snow. I presume it would have averaged say 18 or 19 inches deep, if the wind had not blown so as to drift it.

It was very cold during the storm; range of mercury, from 25 to 8 above zero.

19. Charleston, S. C., 32° 47′ N., 79° 57′ W. (From our correspondent, Ed. C. Keckeley, M. D.)

March 16th, wind south—rain.
17th, wind south—cloudy.
18th, wind NW.—fair.
19th, wind NW.—fair.

The rain of the 16th was very trifling. Since then to this time, (3d of April,) we have had no rain. During the whole of the month of March we have had very little wind; indeed, the atmosphere has been close and sultry.

20. Newbern, N. C. 35° 20′ N. 77° 5′ W. (From Wm. G. Bryan.)

Clear, and pleasant, and calm, on the morning of the 16th. Light wind in the afternoon at south. On the 17th, cloudy and warm. Light rain before day, wind at south. Afternoon cold and cloudy—rain and hail—wind west. On the 18th, cold and cloudy, moderate wind at NW. The 19th

was clear and cold, moderate wind W. 20th, very pleasant—smoky—wind SW.

21. New Garden, N. C., (eight miles NE. of James Town,) 34° 57′ N., 79° 10′ W. (From Jona. L. Slocum, communicated by David Lindsay, Esq.)

On the 16th the weather was cloudy and damp during the day, in the evening some thunder and rain; wind NE. all day. On the 17th, cloudy in the morning, and in the afternoon and evening rain falling, mixed with snow; wind NE. On the 18th, wind NW. till evening, then NE.—cloudy —snow nearly two inches deep. 19th, wind NW. all day, clear and pleasant.

Smithville, N. C., (SE. corner of the state,) 34° 7′ N., 78° 10′ W. (From G. S. Jewett, Esq.)

March 16th, clear and fine; wind SW. probably light. 17th, clear, cold and windy, WSW. 18th, cold, a little rain, windy, NW. Also, 20 miles above Smithville, March 16th, pleasant day: wind SW., very fresh about 1, P. M. 17th, wind not high this day. 18th, not known. 19th, wind NW., pleasant.

22. Alexandria, D. C., 38° 49′ N., 77° 4′ W. (From our correspondent, Wm. E. Harper, Esq.)

The storm commenced on the 16th, and terminated on the evening of the 18th.

The wind blew constantly from the NE. strong on the 16th, 17th and 18th, and there was considerable rain, snow, and hail on the 17th, continuing till noon of the 18th.

On the 19th, wind strong from NW. The thermometer at freezing point before sunrise.

23. Capitol Hill, Washington City, 38° 53′ N., 77° 2′ W. (From our correspondent, Dr. J. M. Foltz, of U. S. Navy.)

The wind on the 16th of March was SE., and light; On the 17th, a strong gale from NE. On the 18th, NE., fresh, and on the 19th, NW., moderate.

At 9 o'clock, on the 17th, it was raining, and had rained $1\frac{1}{100}$ inch; it rained and snowed two inches on the 17th and on the 18th, $\frac{8}{10}$ inch more; making in all 3.81 inches. The barometer was stationary on the 16th at 29.93. It fell by 9 A. M. of the 17th, to 29.758, and at 3 P. M. it was down to 29.60, and was the same next morning.

Dr. Foltz infers, from the great severity of the storm, and from the quantity of rain and snow accompanied with a strong NE. gale, that he was, at Washington, in the centre of the storm.

24. St. John's College, Annapolis, Md., 20° 0′ N., 76° 43′ W. (From our regular correspondent, Prest. H. Humphrey.)

The storm was of great violence, and as far as I know blew steadily from the NE. When I rose on the morning of the 17th of March, it was raining moderately, and I observed the Barometer had fallen from 30.00 to 29.76. It continued to sink all day, and at 6, P. M., was 29.62, and on the morning of the 18th, at 7, was 29.59.

My opinion is, that the wind began to blow about 11, P. M. of the 16th,

at which time I observed a remarkable light, due E., that I took to be an aurora. I watched it for some time after my lamp was extinguished, and it exhibited vivid pencils, as high as 45° or 50°, and cast a strong light, although obstructed by broken clouds. It was soon after this that I noticed the raising of the wind, by its effect on the building. The rain on the 17th turned to snow in the afternoon, which continued through some part, or all of the night, but the quantity was small, leaving but two or three inches on Sunday at noon. The rain fell in torrents, and the gale blew at times as powerfully as I have ever felt it at this place. Its violence abated somewhat on Sunday afternoon.

25. Gettysburg, Penn., (south side of the state.) (From our regular correspondent, JACOB LEFEVER, ESQ.)

The storm commenced with dribbling of rain at 10½, P. M., March 16th, and the heavy fall of snow terminated about 9½, A. M., on the 18th, although there were frequent showers of fine snow till about 5½, P. M. The morning of the 19th was very nearly clear and calm. The wind was NNE., that is, nearer N. than NE. all the time. It commenced with rain; but on the morning of the 17th, the snow was ¾ inch deep, and melting very fast. The whole quantity fallen I calculated at 1.7473 inches. The snow along the mountain, within ten miles of this place, was said to have been at least 2½ feet deep.

The wind was from 2 to 3 from the evening of the 16th till the evening of the 18th. That is, a strong breeze.

26. Bellefonte, Penn., (near the centre of the state,) 40° 54′ N., 77° 47′ W. (From our regular correspondent, JOHN HARRIS, M. D.)

The snow commenced at 10, P. M., of the 16th, and continued till 4, P. M., of the 18th, being a great part of the time mixed with rain; its depth about 7 inches—whole quantity estimated at 1.5 inches of water.

The wind was N. at 7 A. M. of the 16th and gentle; from 2, P. M., of the 16th, till 7, A. M., of the 19th, the wind was constantly very gentle from NE., when it changed to SW. Barometer all day of the 16th, 29.29; at 7, A. M., of the 17th, 29.25; at 2, P. M., 29.24; at 9, P. M., 29.20.

27. Meadville, Penn., 41° 38′ N., 80° 10′ W. (From our regular correspondent, FREDERICK HUIDEKOPER.)

	Thermometer.			Barometer.			Direction & force of wind.		
Day.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
March 16	33°	36½°	29°	28.85	28.85	28.85	N. 1	N. 2	N. 4
17,	29	34	33	28.83	28.83	28.84	ENE. 4	E. 5	E. 3
18,	27	45	27	28.84	28.81	28.77	ENE. 4	ENE. 5	0

On the 16th, snow too slight to be measured.

28. Rochester, N. Y., 43° 8′ N., 77° 51′ W. (From JOHN B. ELWOOD, ESQ.)

	10 o'clock, A. M.				10 o'clock, P. M.			
	Ther.	Bar.	Wind.	Sky.	Ther.	Bar.	Wind.	Sky.
March 15th,	48°	29.60	S.	Cloudy.	40°	29.60	W.	Cloudy.
16th,	37	—.70	NE.	do.	32	—.75	NE.	do.
17th,	36	—.80	E.	Fair.	37	—.75	E.	Fair.
18th,	43	—.65	E.	do.	34	—.50	NE.	do.
19th,	35	—.30	W.	do.	43	—.35	E.	Cloudy.
20th,	32	—.30	NW.	Cloudy.	38	—.60	NE.	do.
21st,	34	—.70	NW.	Showers.	50	—.60	SW.	Showers.

The winds were at no time very strong, or a note would have been made of it.

29. **Onondaga Hollow, N. Y., (middle of the State,) 43° 0′ N., 76° 6′ W., nearly. (From J. L. Hendrick, Esq.)**

We had no storm here except a small snow storm on the afternoon and evening of the 16th of March; the wind NW. all day. On the 17th, the wind somewhat variable, generally N., (A. M.) and N., NNE. and NE., (P. M.;) cloudy all day. On the 18th, wind N. and NNW. (A. M.) and NW (P. M.;) day cloudy. On the 19th, wind variable, but generally W.; day fair. The strength of the wind during those days was also variable; sometimes, and especially from the W. and NW., rather strong, at other times only a gentle breeze.

30. **Silver Lake, Penn., 41° 55′ N., 76° W. (From our regular correspondent, a lady.)**

	Thermometer.			Barometer.			Winds.		
Day.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
March 16,	36°	38°	36°	0 / 28·00	0 / 27·98	0 / 27·98	SSE.2	S3.	S2.
17,	32	38	34	0 / 28·00	0 / 28·00	0 / 28·00	NW.2	NW.2	NNW.2
18,	31	42	58	10 / 28·00	10 / 28·00	10 / 28·00	NW.1	NW.2	NW.3

On the night of the 16th it snowed one inch deep, and on the 17th, it snowed half an inch.

31. **Sunbury, Penn., 40° 53′ N., 79° 50′ W. (From our regular correspondent, Hugh Bellas, Esq.)**

	Thermometer.			Barometer.		
	8 A.M.	Noon.	5 P.M.	8 A.M.	Noon.	5 P.M.
March 16th,	41°	49°		29.45	29.45	
17th,	34	37	36°	29.45	29.45	29.45
18th,	32	38	36	29.30	29.30	29.30

On the night of the 16th snow six inches deep; on the mountains between this and Pottsville, three or four feet deep—no mails for seven days.

Snow, rain and snow, on the 17th, and on the morning of the 18th, the wind NE., on the 16th, 17th, and 18th, except at 8 A. M. of the 17th, when it was E. On the 19th changeable from NW. to SW.

32. **Bucks County Academy, Penn., 40° 17′ N., 75° 7′ W., nearly. (From our regular correspondent, Prof. L. H. Parsons.)**

	Thermometer.			Barometer.			Winds.		
	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.	7 A.M.	2 P.M.	9 P.M.
March 16th,	44°	56°	43°	29.92 / 1	29.82 / 2	29.81 / 0	NE.$\frac{1}{2}$	NE.$\frac{1}{2}$	NE.$\frac{1}{4}$
17th,	37	35	33	29.87 / 0	29.81 / 0	29.73 / 0	NE.$\frac{1}{2}$	NE.2	NE.3
18th,	32$\frac{1}{2}$	34$\frac{1}{2}$	33	29.60 / 0	29.65 / 0	29.65 / 0	NE.2$\frac{1}{2}$	NE.1	NE.1

It rained on the night of the 16th; depth of snow, 5 inches in all; ceased on the night of the 17th. Snow and rain, 2.48 inch water.

33. **Reading, Penn., 40° 18′ N., 75° 55′ W. (Observed by C. F. Egelmann, Esq., communicated by Saml. Ritter, Esq.)**

March 16th, cloudy, with NW. wind at 2, P. M. Temp. 62°. 17th,

rain at 7, A. M., turning to snow at 7½; snow continued, with occasional rain, till the morning of the 18th, wind strong from NE. all the time; in the evening it changed round to NW., and was NW. and W. next day. On the 17th, the thermometer was from 34° to 33° all day.

34. Philadelphia, Penn., 39° 57′ N., 71° 11′ W. (By James P. Espy, Meteorologist of Joint Committee.)

March 16th, wind very gentle N., and clouds from SW. 1, and cloudy at 7, A. M.; wind got round to NE. 1 before 2, P. M., clouds still coming from SW. 2; a slight sprinkle of rain at 9, P. M.

17th. On the morning of the 17th, at 7, it began to rain, mingled with hail; it rained much during the morning, and snowed much in the afternoon, wind and clouds from NE.; storm increasing in violence all day, and continued very violent all night, until 9, A. M., of the 18th, when it began to abate, and at 1, P. M., it had nearly ceased snowing; wind still very strong N. E. A little snow in the afternoon, and by 6, P. M., the wind had veered round to N. by E., and gradually died away in the night; and on the morning of the 19th it was, with the lower clouds, N., very gentle, and the upper clouds from the west, moving quite slow.

The barometer was stationary on the 16th, at 29.91, and fell on the 17th, from 29.93, at 7, A. M., to 29.78, at 9, P. M., and was at its lowest, 29.68, on the next morning. The thermometer ranged from 44° to 55° on the 16th; from 37° to 33° on the 17th, and was only 33° at 2, P. M. The dew point was 38°, or 17 degrees below the temperature of the air on the 16th, at 2, P. M.; and at 2, P. M. of the 17th, it was almost the same as the temperature of the air itself, or 33°.

Greendale, Penn., (west of the centre of the state.) (From our regular correspondent, H. B. Wright, Esq.)

March 16th, calm, clouds from N., small rain P. M., cloudy all day. 17th, calm till 11, A. M.; snow all day and all night till 9, A. M., of the 18th; clearing at 6, P. M., with fog in the night.

Wind NE. on the 17th; calm again on the 18th; warm on the 20th, with high waters. Whole quantity of water deposited, 68.100.

35. Snow Hill, Md., (Eastern Shore, southern part,) 38° 10′ N., 75° 25′ W.

On the morning of the 16th, appearances of rain; at 4, P. M., raining, wind nearly calm, NE. On the 17th, at 8, A. M., rain—wind ENE. 4; it rained all day, wind NE. 5, and continued to blow hard all night, frequently raining hard. Towards day on the 18th, it became moderate, and at 11, A. M., wind was N. 4, still cloudy and dark; at 5½, wind N. 4, rain, mixed with snow. On the 19th, in the morning, the wind was west, and moderate; at 4, P. M., it was northerly and clear.

36. Log Book of ship Algonquin, near Delaware Capes.

March 16th, noon, civil reckoning,—Light airs from WSW., and clear; at 1, P. M., calm; at 6, P. M., light airs from E.; sounded in 50 fathoms water; midnight, strong breezes from E. by N., and hazy; at 4, A. M., strong breezes and rain; 35 fathoms water; at 5 took in top gallant sail; double reefed the mizen top sail; at 7 double reefed the fore and mizen top sail, took in the jib; at 8, strong gales, and thick rainy weather; 18 fathoms water; wore ship's head to SE., [to avoid coming on shore;] at 11, A.

M., gale ENE., increasing; moderately strong, and a high sea; raining very heavy; sounded 22 fathoms water; continuing with strong gales NE. by E.; heavy squalls and torrents of rain; bearing a heavy press of canvass to get off shore; at 4, P. M., took in main sail; 23 fathoms water; at 6, P. M., 30 fathoms water; took in fore topsail; *at* 10 *minutes past* 6, *fell start calm;* left a very heavy sea; midnight *calm*; cleared off; very heavy swell; at 2, A. M. of 18th, light air from south, set the fore sail and fore top sail; shut in thick; at 4, A. M., light airs and thick weather; at 5, A. M., set single reefed top sails, jib, and spanker main sail, wind still south; at 8, set the top gallant sails; thick weather; noon, moderate breezes, wind baffling.

Batavia, N. Y., (near NW. Corner of the state,) 42° 58′ N., 76° 20′ W., nearly. (From W. H. Webster, Esq.)

Wind on the 16th, 17th and 18th of March, fine acicular crystals of snow falling all day of the 16th, but now lying on the ground. Sun seen through the clouds all day on the 17th.

37. Catskill, N. Y., 42° 10′ N., 73° 52′ W. (From the Postmaster.)

Between the 16th and 19th of March, about 3 inches of snow fell; wind southerly at first, soon veering about SE., N. and NW.; a heavy gale on the 18th and 19th, wind northerly.

38. Pottsdam, N. Y., 44° 38′ N., 74° 59′ W. (From David S. Shelden, communicated by H. Allen, Esq., P. M.)

March 16th, wind all day N., with a little snow in the morning. On the 17th, cloudy in the morning, clear in the afternoon; wind all day NE., light. On the 19th, clear in the morning, a little rain in the afternoon; wind NE. in the forenoon, and SW. in the afternoon, very light.

39. Montreal, Canada, 45° 31′ N. 73° 35′ W.

From the Journal of James McCord, Esq. it appears that it neither rained nor snowed here during 16th, 17th, 18th, 19th or 20th of March, and the wind blew steadily, but not violently, from the North, on the 16th, 17th, 18th and 19th, and on the 20th shifted to the N. W.

The Barometer stood as follows:

16th	morning,	30.040	evening	30.124
17th	"	30.250	"	30.200
18th	"	30.088	"	29.890
19th	"	29.678	"	29.464
20th	"	29.724	"	29.750

The mean of the maximum and minimum of the thermometer, during those days was 31° and 8°.

The mornings were generally clear and fine, growing cloudy towards the evening. The strength of the wind may be called a *fresh breeze.*

40. University of Vermont, Burlington, 44° 30′ N., 73° 12′ W. (From Prof. Geo. W. Bluedict.)

There was no storm here of any kind during the days in question. The whole month of March, previous to that time, was remarkable here for its mild and quiet character. East winds are almost never known here.

Though I made no record of the wind on the days mentioned in the circular, I am confident that the set of the air (quite slight) was from the south, and the weather pleasant.

41. Charlestown N. H. 43° 14′ N. 72° 25′ W. Dr. S. Webber.

March 16th, wind N. E. cloudy, broke away partially for a little while about noon shewing many broad streaks of cirro-strati—in the afternoon, sky again overcast looking like rain, Therm. 34°.

17th, wind N. E., cloudy through the day—at noon wind became E. but changed again to N. E., Therm. 36°.

18th, wind N. E. fresh and raw, about 11 A. M. began to snow which continued moderately through the day, Therm. 29°.

42. Jafrey, N. H., S. W. corner of the State, 42° 45′ N. 72° 5′ W.

L. Howe, Esq. informs us that there was no storm there—only one inch of snow on the 18th, at noon, fair on the 19th. On the 16th and 17th, wind not recollected.

43. Wesleyan University, Middletown, Con., 41° 34′ N., 72° 39′ W. (From our regular correspondent, Prof. Aug. W. Smith.)

On the morning of the 16th, at 7½, A. M., the wind was noted NW., the rest of the day N., quite gentle. On the 17th, wind N. at 7½, A. M.; and clouds NE.; at 12, meredian, and 5½, P. M., wind E., and gentle all day; cloudy, with slight rain at 2, P. M. On the 18th, snow about two inches deep all the morning; time of beginning not mentioned; wind NE. all day, and strong. 19th, wind NE., A. M., strong, and NW., P. M., gentle. Barometer rose from 29.81 on the morning of the 16th, to 30.11, at 5½, P. M., of the 17th; fell again till 5½, P. M., of the 19th, when it was 29.70.

44. Newport, R. I., 41° 28′ N., 71° 21′ W. (From our regular correspondent, R. J. Taylor, Esq.)

March 16th, wind from NW. in the morning, and SW. P. M. 17th and 18th, and morning of 19th, NE.; then NW. at 2, P. M., and SW. at 9, P. M.—*heavy on the 17th.*

		7 A. M.	2 P. M.	9 P. M.
March 16th,	Barometer	29·65	29·72	29·80
		10	10	0
17th,	"	29·90	29·90	29·86
		0	0	0
18th,	"	29·67	29·57	29·51
		Snow.	0	0

Snow from 6 to 12 inches on the 18th.

45. Brown University, Providence, R. I., 41° 50′ N., 71° 25′ W. (From our regular correspondent, Prof. Alexis Caswell.)

		Barometer.			Thermometer.		
		S. R.	1 P. M.	10 P. M.	S. R.	1 P. M.	10 P. M.
March	17th,	29.90	29.96	29.91	35°	38°	34°
	18th,	—.74	—.70	—.60	31	32	28
	19th,	—.74	—.45	—.41	28	38	34

		Winds.			Weather.		
		S. R.	1 P. M.	10 P. M.	S. R.	1 P. M.	10 P. M.
March	17th,	NE.	NE.	NE.	var.	cloudy.	cloudy.
	18th	"	"	"	snow.	snow.	snow.
	19th,	"	easterly.	easterly.	cloudy.	cloudy.	clear.

The 15th was mild and pleasant—16th do. and wind came to NE. A. M.; on 17th wind NE. brisk and raw, increasing towards night and cloudy. Wind heavy during the night.

On the 18th snow began to fall about 6 A. M., wind heavy NE., snow continued till after 10 P. M. but ceased before morning. The wind was so violent during the storm, that the snow was considerably drifted; quantity half an inch water.

46. Dedham, Mass., 42° 15′ N., 71° 11′ W. (Journal of Mr. Talbot, communicated by Elisha Thayer, Esq.)

16th, fair, moderate NE. wind.
17th, cloudy, strong NE. wind.
18th, cloudy, very strong NE. wind, with 2½ inches snow.
19th, cloudy, moderate NW. wind.

47. New Bedford, Mass., 41° 37½′ N., 70° 56′ W. (From Richard Williams, Esq.)

	Ther.	Bar.	Wind.	Weather.
March 16th, sunrise,	37°	30 00	NW. light.	clear.
2 P. M.	49	30.09	NE. mod.	clear.
9 P. M.	41	30.18	" "	cloudy.
17th, sunrise,	37	30.23	" fresh.	"
2 P. M.	40	30.29	" "	"
9 P. M.	35	30.26	" high.	"
18th, sunrise,	34	30.11	" "	beginning to snow.
2 P. M.	33	29 99	" "	snowing lightly.
9 P. M.	33	29.91	" fresh.	cloudy, water fallen .60.
19th, sunrise,	32	29.78	NNE. "	light snow.
2 P. M.	36	29.71	N. mod.	clouds broken, P. M.
9 P. M.	32	29.74	westerly, light.	clear. [clear.

Northboro, Mass., 42° 16′ N., 71° 48′ W., nearly. (From Joseph Allen, Esq.)

March 16th. This was a mild, pleasant day, wind SW.; some time during the night the wind shifted into the NE.; and the 17th was raw, cold, and cloudy—wind pretty strong from NE. Early on the 18th, the snow began to fall, and the wind to rise; and through the day the storm continued without intermission, though its violence abated somewhat in the latter part of the afternoon. The snow was quite moist, yet so great was the violence of the wind, that it drifted a good deal, probably about six inches in depth.

Williams College, Mass., (NW. corner of the state,) 42° 30′ N., 73° 12′ W.

President Albert Hopkins states that from the 16th to the afternoon of the 17th, the wind was NW., and then changed to NE.; that it commenced snowing soon after breakfast on the morning of the 18th., wind N., or perhaps a little E. of N. On the 19th, it was from N. to NW., and clear. The thermometer varied only from 30.5° to 39° till the 19th, when it rose to 43°, wind very light.

48. Concord, N. H., 43° 12′ N. 71° 29′ W. From John Farmer, Esq.

The storm was hardly felt here. The weather was cloudy all day, on the 17th of March with the wind E. and N. E. On the 18th a light snow commenced at noon, and continued through the afternoon, enough to cover the ground.

The wind was brisk part of the day, from the N. E. The highest point of temperature during the day was 33° and the lowest 28°.

On the 19th at 9 A. M., all appearances of a storm had ceased, wind N. W. as it had been on the 16th.

The Thermometer stood as follows:—

	6 A. M.	Highest	9 P. M.
16th	33°	54°	43°
17th	36°	43°	35°
18th	33°	33°	28°
19th	28°	50°	38°

49. Bethlehem, N. H. 44° 20′ N. 71° 35′ W.

William Kenney, Esq. informs us that there was no storm here, the weather was mild and pleasant till the afternoon of the 18th, when there was a very little snow—the wind was very little, westwardly.

50. Portland, Maine, 43° 39′ N. 70° 20′ W. From the Diary of Lemuel Moody, Esq.

March 16th from morning to noon, light N. E. airs and clear weather. P. M. clear, calm, warm and pleasant. Thermometer at sunrise, 34° noon 46°, 8 P. M. 40°.

17th, from sunrise to noon, clear weather, with light N. E. airs. P. M. cloudy with light S. E. airs, inclining to calm.

Therm. 30° 38° 32°.

18th, forenoon brisk wind, varying from E. N. E. to N. E., with thick cloudy weather, particularly so in the south quarter. At half past one, commenced a moderate N. E. snow storm, wind not more than a brisk gale. Snow fell very moderately and ceased the first part of the evening, snow 1½ inches deep.

Therm. 30° 30° 26°

19th, forenoon moderate N. E. winds and cloudy. P. M. light winds from E, round to S. Evening clear, calm and pleasant.

Therm. 28° 45° 38°

The foregoing furnishes a summary of the information received concerning the storm, both from our regular correspondents, and in answer to the circular issued by the joint committee.

The following facts, chiefly collected from the newspapers of the day, will be found highly interesting in connexion with those already given.

From the American Sentinel, March 23.

Arrived at Philadelphia, March 23d, packet ship Algonquin, having been 11 days to the north of Cape Hatteras. On the 17th, at 8, A. M., Cape Henlopen bearing NW., distant 15 miles, took a heavy gale E. by N.; hauled off. On Sunday, the 18th, latitude 37° 50′, spoke brig Venus, for New York, who had lost two men and jib boom by gale on day previous.

From the Mercantile Advertiser of the 19th March, 40° 42′ N. 74° 1′ W.

The wind on the 17th and 18th was heavy, NE., accompanied with snow. Of course nothing got to sea from N. York, and but few vessels arrived.

From the same paper, of the 20th March.

Lewis, 38° 35′ N., 75° 12′ W. (Correspondence of Philadelphia Exchange.)

March 16th. Wind now at E., and weather very lowery.

March 17th, 2, P. M. The schooner Samuel McDowel, and shortly after the schooner Richmond, came on our beech, the wind ENE., and blowing a heavy gale.

Morning of the 18th. The Richmond has gone to pieces. From 4 till after 12, last night, the wind blew with great violence, and the sea made considerable breaks over the breakwater.

From the same paper of the 24th.

A number of outward bound vessels are detained, owing to the E. winds which have prevailed some days.

From the same paper of the 26th.

Schooner William, off Cape Hatteras, N. 35° 14′, W. 75° 30′, on the 19th, in a gale WNW., lost the deck load.

From the National Gazette of the 20th.

Cape Island, March 18th. I cannot describe to you the horrors of last night. The rain fell in torrents, and the wind, NE., blew such a gale that it baffles all description. On yesterday afternoon the wind was increasing, with rain, hail, and snow.

From the Commercial Herald and Pennsylvania Sentinel of the 20th.

Norfolk, 36° 51′ N, 76° 19′ W., 18th March. The wind continues from N. to NE. It rained nearly all day yesterday, the 17th.

From the same paper of the 22d.

Fifteen schooners at Little Egg Harbor dragged their anchors.

From the same paper of the 27th.

Arrived, ship Sabina, 50 days from Rio de Janeiro. Had been off the Capes of Delaware in thick fog from the 21st. Experienced tremendous gales from WSW. on the 17th and 18th March.

From other papers not recollected.

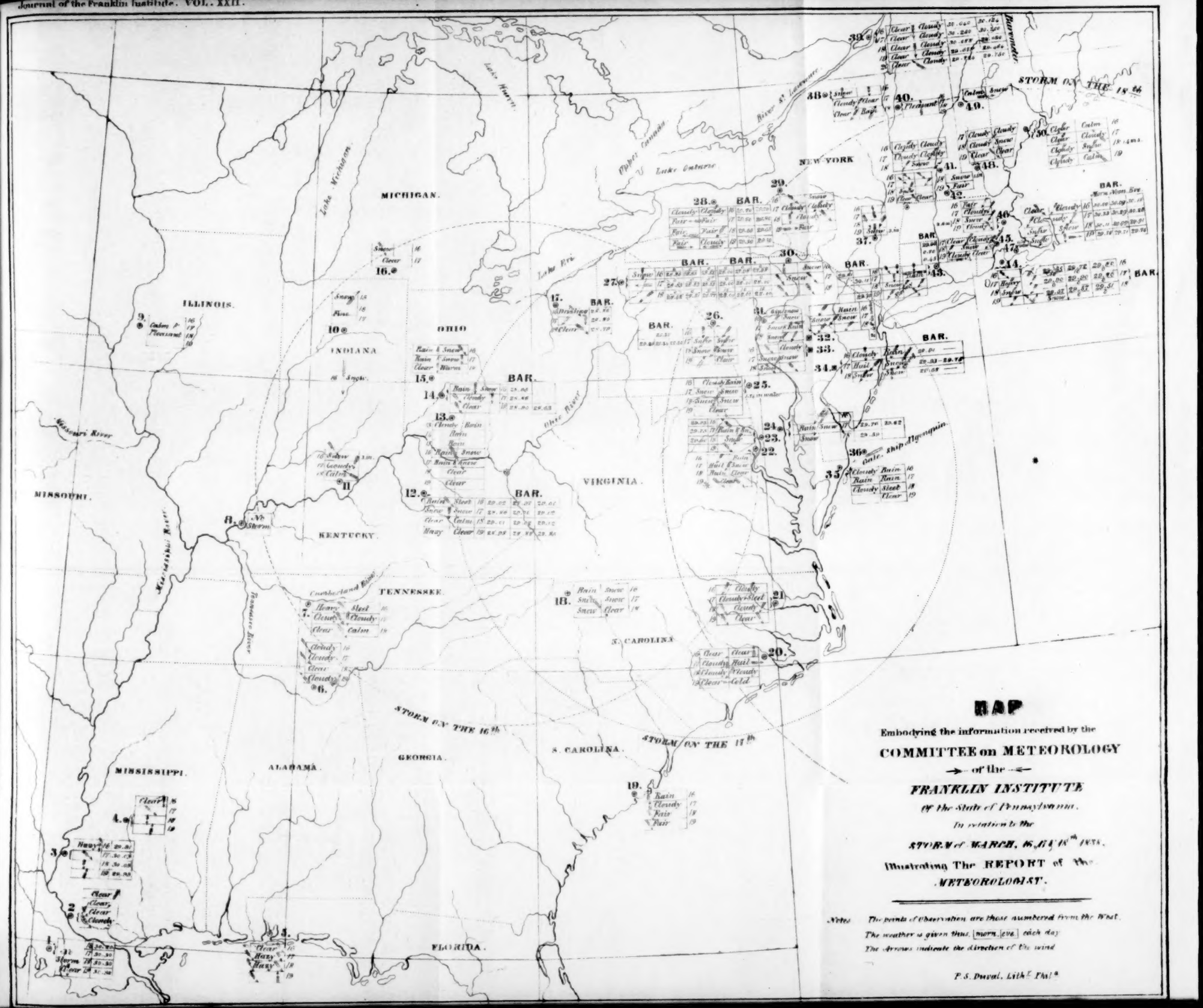
Schooner Caroline, in a gale on the 18th, lat. 40° 24′, long. 72° 12′, lost a man overboard.

Brig Russel, lat. 38° long. 73°, lost stern boat and davits on the 18th, during a severe NE. gale.

Packet ship North America arrived in New York on the 19th. She had to heave too from Sunday morning till Monday morning, (that is, from the 18th till the 19th) during which time it blew a gale ENE. outside the Hook.

From the Baltimore American of the 20th.

The fall of snow on the 17th and 18th, was deeper to the west than at



MAP

Embodying the information received by the

COMMITTEE on METEOROLOGY

of the

FRANKLIN INSTITUTE

of the State of Pennsylvania.

In relation to the

STORM of MARCH, 16, 17 & 18th 1838.

Illustrating The REPORT of the METEOROLOGIST.

Note. The points of Observation are those numbered from the West.
The weather is given thus, [morn. | eve.] each day
The Arrows indicate the direction of the wind

P. S. Duval, Lith.r Phil.a

From the Baltimore American of the 20th.

The fall of snow on the 17th and 18th, was deeper to the west than at

this place. The mail carriage, which was despatched from Frederick, west, with eight horses attached to it, was so effectually impeded by the snow, that the driver was compelled to return to Frederick. The snow on the Alleghanies, some days ago, was two feet deep along the turnpike, from Cumberland to Wheeling, and the mails were carried through with the greatest difficulty.

From the United States Gazette of the 21st.

Packet ship Pocahontas rode out the gale of Saturday night, the 17th, off the light house, on the Brandywine shoal. At one time the gale was so violent, that it was feared her masts would have to be cut away.

The same paper of the 22d states, from the Delaware Breakwater, that the gale was the most severe ever experienced at that place.

JAMES P. ESPY, *Meteorologist*.

Mechanics' Register.

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER 1837.

With Remarks and Exemplifications by the Editor.

343. For improvements in the mode of *Preparing Paint for protecting Buildings from fire;* Louis Paimboeuf, city of Washington, November 11. (See Specification.)

344. For an improvement in the *Construction of Bridges;* Francis Good, New London, Chester county, Pennsylvania, November 4.

The claim made under this patent is to "the method of uniting and binding the wood and masonry of the bridge together, by means of the vertical iron bolts passing through the sills, stone walls, wall plates, beams, iron plates, and flooring, and keyed at top, in the manner described, by which the bridge is rendered very strong, and not liable to be washed away by the sudden rising of the water; also the addition of iron plates over the beams, and over the sloped ends of the wall."

The whole plan is simply to build the vertical walls of road, or similar bridges, which are to sustain a wooden floor so that the walls shall be founded upon ground sills, through which iron bolts are to pass, standing vertically, and surrounded by the masonry; these bolts are to extend through wall plates, or cap timbers, which may be covered with iron, upon which they are to be secured by keys or nuts.

The contrivance is a very simple and obvious one, and bears a striking analogy to known devices in masonry. It has very probably been previously adopted for the same purpose, and in the same way with that set forth, but no evidence of this appearing, or being recollected, the patent was granted.

345. For a *Truss for Hernia;* Richard Salisbury, Providence Rhode Island, November 4.

There is more mechanical skill displayed in the adjustments of this truss than in most of those which have been the subject of patents, and on this its utility is dependant. As a surgical instrument, it does not possess any

novelty. The end of the spring which sustains the pad, is made square, and passes through a square hole in a piece of brass which forms a part of the adjustment of the pad, which can be slipped off, and reversed, and thus adapted to either groin. This, it is true, is of no great consequence, as the disease itself is not of a shifting character, and trusses are not left as heir looms; there, however, is nothing objectionable in this part. The said piece of brass carries a ratchet adjustment to alter the slope of the pad, as in many others. The back plate of the pad is of metal, in the centre of which there is a hole through which the stuffing of the pad may be regulated; a metal lid, or button, covers this hole. The pad swivels to the necessary distance so that it can receive an inclination to the right, or left, and be fastened by a screw. There are six claims made to individual parts, some of them of doubtful originality.

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346. For a *Machine for Shaving Shingles;* Aaron H. Akin, Sparta, Crawford County, Pennsylvania, November 4.

The shingle to be shaved is placed upon a bench by an attendant, and a knife, fixed in a sliding frame, is drawn over it by the action of a crank and pitman; there are contrivances operating as a stop to the shingle as the knife passes over it, and for relieving it at the proper time. The claim is in general terms, and the construction and operation of the machine are not very clearly described, although they might be made out by some special study.

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347. For an improved mode of constructing the *Gauges in Machines for sawing Shingles*; Akanah Leonard, Canton, Oxford county, Maine, November 4.

The gauges referred to are those for cutting the block to be sawed, and the claim made to them in their improved form is to "the mode of changing the attachment between the gauges and the sliding block at a greater or less distance from the centre of the latter, and the method of attaching them as described;" the particular arrangement for doing which would require the drawing for its explanation.

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348. For an improvement in *Stoves;* Henry H. Roath, Norwich, Connecticut, November 4.

There is some peculiarity in this stove, which is one of the vertical cylinder kind, and intended for heating only; the peculiarity consists in the manner of arranging certain tubes and chambers for the passage of heated air, and certain openings for its escape. The claims made are confined to these particular matters of construction, which do not appear to demand any special notice.

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349. For an improved *Cooking and Warming Stove;* John Morris, Derby, New Haven county, Connecticut, November 4.

This is an open stove, or rather a combination of open stoves, intended for warming parlors, or to be used for cooking. The front of the grate is in the form of a segment of a circle, about three feet long, and divided into three compartments, appearing like three open grates placed side by side. These project out from the fire place, and are covered by a flat plate extending over the whole of them. In this plate there are three

openings for cooking utensils, and others for feeding the fire. The three compartments are to be used conjointly, or separately, and the draft from them all unites in one common flue, or discharge pipe, valves being employed to govern their action. Above, and behind, the fire places, there is an oven surrounded by flues, through which the heated air may be made to pass back and forth before it reaches the chimney. Certain modifications of its respective parts are described, and a claim made to the manner of combining them, as set forth.

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350. For a *Machine for Moulding and Pressing Brick;* Henry Waterman, Bath, Lincoln county, Maine, November 4.

In this machine the clay is to be put into a mixing tub, or pug mill, in which it is acted upon by knives so beviled as to act as conveyors to force it downwards, and to cause it to pass through two openings on opposite sides of the tub, into two chambers, or boxes, the bottoms of which are formed of open divisions corresponding with brick moulds which are to be passed in below the chamber. A piston, forming the top of the chamber, is depressed by suitable machinery to force the clay into the moulds. The particular arrangement for moving the respective parts we shall not attempt to describe, but they of necessity form the subject matter of the claims, as the general construction is without novelty.

Claim. "The invention claimed by me, and which I desire to secure by Letters Patent, consists in, *first*, the method of moving the piston by means of the cams and frames as before described. *Second*, the method of moving the carriage by the arrangement of the arms attached to, and moved by one of the cams, as described. *Third*, the construction of the conveyors for conveying the clay from the mixing tub, through the apertures at the bottom thereof, into the chambers, in combination with the other parts of the machine, as described. *Fourth*, the second method of moving the piston by the crank, or hook. *Fifth*, the method of regulating the pressure of the piston by the nuts on the ends of the vertical rods."

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351. For an improvement in *Stoves, Grates, Boilers and Ovens;* Caleb Stade, city of Troy, New York, November 11.

The following claim if not distinguished by depth, is certainly not deficient in length. As we have observed on more than one occasion, but little of actual novelty is to be looked for in stoves. Perhaps when some new kind of fuel is pressed into the service, which shall differ as much from the kinds now in use, as does anthracite from bituminous coal, and from wood, we may actually see stoves differing in species from those now employed, but until then it will be best to expect varieties only, artificially produced by the crossing of breeds. But to the claim. "What I claim, is the manner of constructing the air chamber between the flanch which supports the grate and furnace, and the external plates of the stove, in combination with the air chamber next above it, in the manner, and for the purposes described. The manner of constructing the platforms, and of attaching them to the stoves, and supporting them in that combination, and detaching them from it, in combination also with the air chamber, in the manner and for the purposes described. The manner of constructing the boilers, with the manner of applying the hot air from the air chamber to, and in heating both, in combination with each other, and with the stove of the

above description. And also the double oven in combination with the same stove, and for the uses and purposes described."

Some of the things above claimed we could readily describe, but we do not wish to give the requisite time and space. Some of the others it might puzzle us to pourtray in words, and if described it might also puzzle our readers to discover their importance; we therefore forbear; a thing we are the more willing to do as fashion, which in every thing bears sovereign sway, has its capriciousness fully exemplified in stoves; the ornaments of ladies heads are scarcely more changeable. We have every winter *ne plus ultra* stoves, and the next winter we go far beyond them.

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352. For a *Machine for Cutting and Dressing Granite and other Stone;* Wm. C. Poland, and Earl Blossom, Portland, Cumberland county, Maine, November 11.

This machine, we are told, consists essentially of four parts, "1st. a gang or set, or sets, of drills, to aid in reducing the face of the stone to an even surface. 2nd. A set, for breaking the pieces left between the holes made by the drills. 3rd. A gang of cutters to do the work usually done by chisels. 4th. A gang of finishers."

The drills operate much like those used for hand drilling, in blasting rock, but their shafts are to be lifted by cams, and they are to be gauged so as to enter the stone to a given depth; provision is made to cause them to turn to a certain distance between each stroke. Rows of holes are thus to be successively made. When this is completed, the set which is to cut away the portion between the holes, is made to operate in a curved direction, something like a cooper's adze. The other instruments are afterwards made to pass over the surface thus prepared, for the purpose of finishing. The claims are to "the combination and arrangement of the drills, set, cutters, and finishers, in the manner described. The form of the set, extending quite across the face of the stone to be dressed, in combination with the other parts of the machine. The method of vibrating the drills as described."

Since the publication of the account of the successful operation of Hunter's patent stone planing machine, in Scotland, a number of similar machines have been made the subject of patents with us, but hitherto we have not received any anthentic history of their successful operation. The reason, we apprehend, is the intrinsic difficulty of causing such machines to operate well upon stone of the texture of good granite. Such stones have been actually dressed by the machines, but we apprehend that the difficulty of keeping the cutters in order has been found to be very formidable, and that it will so continue.

We have, in more than one instance, been assured that we should see the machines in use at the public buildings in Washington, but are still in waiting. We are using, as well as some granite, much miserable sand stone, which they might cut, although they would occasionally meet with a pebble that might require more humouring than would comport with the steady progress of a machine; our granite, we fear, will still bid them defiance, in which case the walls of our public buildings may continue to be built, as they have heretofore of *filtering stones.*

353. For an improvement on his *Machine for Cutting Meat;* patented February 25th, 1835. John Morris, Derby, Connecticut, November 11.

Those interested may see our notice of the original machine at page 170, vol. xvi. The improvements claimed are "the scraper, as specified. The alteration in the machine whereby the cutting is performed by a single horizontal knife, aided by the scraper; by which a multiplicity of knives are dispensed with, all clogging avoided, and the machine rendered more simple, &c."

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354. For a machine for *Separating Garlic from Grain;* Henry Staub, Sheperdstown, Jefferson county, Virginia, November 11. (See Specification.)

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355. For an improvement in the construction of *Locks for Fire Arms;* Ethan Allen, Grafton, Worcester county, Massachusetts, November 11.

The claims made are to the trigger, which is not only to discharge, but also to cock the piece ready for a new charge. To the dog or catch, which can be thrown out of action when not wanted, and leave the tumbler free to the action of the main spring; the tumbler is claimed as of an entirely new construction. The particulars of these novelties are shown in the drawings, but it is unnecessary to dwell upon them here.

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356. For improvements in the mode of constructing *Vessels to be used as Life Preservers;* John Macintosh, city of New York, November 11. (See Specification.)

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357. For improvements in the mode of constructing *Refrigerators;* Robert D. Burns, city of Baltimore, November 11.

This refrigerator is, we are told, "with the exception of the outer case, constructed entirely of metal; zinc, on account of its economy, and its adaptedness to the purpose, being generally employed. The metallic interior is divided into any number of compartments that may be required, the partitions being all united to the main lining of the exterior box or case, by riveting, and soldering, so that the whole shall form one continuous receptacle of metal; in consequence of the conducting property of which, the cooling of one part will rapidly influence the whole." After these preliminary remarks, the specification points out what is deemed a convenient mode of forming the divisions, and the following claim is made.

"What I claim as my invention is the forming the whole interior of my cooler of metal the continuity of which is unbroken, or rendered perfect by soldering, in the manner described, so that the cooling influence operating in one compartment, may be readily communicated to the whole by the conducting power of the metal; and this I claim in conjunction with the arrangement for retaining and drawing off the water produced by the melting of the ice, as set forth."

358. For improvements in the machine for *Cutting Shingles, Staves, Heading, and other articles;* George Park, Peterboro, Madison county, New York, November 11.

A machine of this kind is too complex for verbal description. The specification extends through ten pages, and the claims refer principally to methods of effecting the different objects in view, which, though sufficiently novel to be claimed, do not offer any thing of a striking character. The claims alone would not convey any information.

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359. For a *Machine for Cutting Staves for Barrels, &c.;* Thomas Peck, Lenox, Madison county, N. York, November 20.

The remarks made on the foregoing machine apply with equal force to this.

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360. For an improved *Combination Cooking Stove;* Jordan L. Mott, city of New York, November 11.

We shall probably obtain cuts of this stove, and publish the entire specification. The points claimed are a rotary top plate, which is double, forming an air chamber between the two; the perforations for cooking utensils being surrounded by connecting rims. There is a chamber for heated air, peculiarly constructed, and claimed in combination with the above named double plate; and also in combination with a circular oven above the rotary plate, which oven, when not used for baking, encloses the boilers, and economizes the heat. There is an oven behind the fire, and a claim made to the dispensing with the bottom plate, in this and similar ovens, so as to admit the heated air directly into the oven itself.

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361. For an improved *Cooking Stove;* James N. Olney, city of New York, November 20. (For Specification, see vol. xx, p. 407.)

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362. For a machine for *Printing on both sides of a continuous sheet of Paper;* Thomas French, Ithaca, Tompkins county, N. York, November 20.

The machinery described in the specification of this patent is intended for printing on both sides of a continuous sheet of paper, as it comes from the couching cylinders of the paper mill. Stereotype plates are to be affixed upon the faces of cylinders, or rather of polygons, the paper passing from one such revolving polygon to another, being conducted and confined by tapes, whilst it is passing and receiving the impression. After being printed it is to pass to the drying cylinder, and thence to a cutting apparatus, or to a roller upon which it is to be wound. The manner of inking the plates, of giving the impression, of making register, &c., &c., we shall leave to be imagined, as the tale would be too long to be told here.

When an establishment is made, and carried into successful operation, we shall be most happy to collect and display all the details; should we live, however, we hope to accomplish much other work before being called to this, as we are apprehensive that the consummation will not be an early one. There is no novelty whatever in the idea of such an establishment; we have often conversed respecting it with an intelligent and enterprising paper maker, who made some attempts of the kind many years since, but relinquished the plan, not as impracticable, but as altogether ineligible. The

paper mill and the printing office must be together; the works printed must be such only as are wanted in vast numbers, and the rapidity of the printing must be governed entirely by that of the forming the sheet of paper. These are some of the objections which present themselves, and many others might be brought forward were it necessary.

The claim made is to "the combination and arrangement of the different parts of the before described machine for printing both sides of a continuous sheet of paper at one operation; whether effected in the manner set forth, or in any other substantially the same in principle."

This claim confines the patentee to an arrangement substantially the same with that described, in all its parts, but the specification does not point distinctly to any thing possessing this character. The thing in itself, as we have before remarked, is not new, and if any one wishes to apply a double cylinder press, for printing upon both sides of a sheet of paper, as it comes from the mill, there is no power any where to prevent him. The right, however, is scarcely likely to be legally contested.

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363. For improvements in the *Brick Press;* Henry Waterman, Bath, Lincoln county, Maine, November 20.

Those familiar with the modern devices in the brick press may form some idea of that above named, from the claim, which is as follows:

"The invention claimed by me consists in attaching the follower to the piston by loose rods (with heads,) which slide upwards through apertures in the pistons whilst the latter is in the act of pressing the brick on the top; and when said piston is again raised, the top of said piston coming into contact with the heads on the ends of said rods, and raising the follower suspended thereto, with the brick, which it thus discharges from the mould, at the same time said follower or discharger sliding loosely over the hanging arms by which the follower is suspended from the cross head for pressing the brick on the under side, in combination with the before described mode of pressing the upper and lower sides of the brick simultaneously, as set forth."

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364. For an improved *Cooking Stove;* Daniel Hastings, and Solomon Sykes, Deerfield, Franklin county, Kentucky, November 23.

The peculiarity in this stove consists in the manner of constructing those boiler holes which are immediately over the fire. These holes are surrounded by collars which rise up and receive the boilers, and within them there are loose cylinders with rims resting on the tops of the collars, and capable of being turned round, so that openings made in their sides and bottoms may coincide with openings which admit the draft from the fire to pass around boilers contained within them, or refuse a passage to such draft. The claim is to "the cylinders, both outer and inner, made and constructed as described, and placed and used in manner aforesaid."

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365. For an improvement in the mode of *Applying the Driving Wheels of Locomotive Engines;* Andrew M. Eastwick, city of Philadelphia, November 20.

"In my locomotive engine I use eight wheels, two pairs of driving, and two pairs of guide wheels; the latter not differing at all in the manner of arrangement or operation from such as have been heretofore employed. My improvement consisting entirely in the mode in which I construct an

independent frame, or truck, to receive the axles of the four driving wheels and in which I connect the same with the main frame of the locomotive."

The independent frame which carries the four driving wheels, has a projecting piece, or gudgeon, on the centre of each of its sides, which extends out, and enters slots in pedestals on either side of the main frame. The springs above the frame act upon sliding boxes in these pedestals through the intervention of bolts, in the ordinary way. The independent truck has, consequently, a vibratory motion lengthwise on the gudgeons of the frame, whilst it yields laterally by the action of the springs.

There is a contrivance described for throwing a larger portion of the weight of the engine than usual upon the driving wheels. This is effected by means of a bolt and screw nut, acting upon the engine frame, and upon the independent truck of the driving wheels, so as to draw them together, and perform a lifting action upon the guide wheels.

"What I claim as my invention and wish to secure by Letters Patent, is the employment of four driving wheels in a locomotive engine, in such a manner that these wheels shall have the bearings of their axles in an independent frame or truck, connected with the main frame of the locomotive, substantially in the way herein described. I also claim the transferring of any portion of the weight usually borne by the guide wheels, on to the driving wheels, upon the principle by me set forth."

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366. For an improvement in the *Horse Rake*; David Dewey, Pultney, Rutland county, Vermont, November 23.

The teeth of this horse rake are to be "of iron or steel, from one quarter to one half an inch in diameter, and are three feet long. They are bent at right angles one foot from their ends, forming a perpendicular of one foot, which bears upon the ground when the rake is in motion. From these angles the teeth extend two feet horizontally forward to the head of the rake, to which they are confined by nuts and screws. What I claim as my improvement in the above described machine, is the iron or steel, or other elastic rods, or teeth, as above specified."

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367. For an improvement in the *mode of constructing Double Centered Joints, Butts, or Hinges;* Egbert Hedge, Hartford, Connecticut, November 23.

These hinges resemble card table hinges, to which as well as to other purposes it is intended to apply them. The principal object of the patentee, however, is to use them as rule joints, as in this case the rule when closed has no projecting joint at its end, but all is flush with the end of the rule. As ordinarily made, however, with two joint pins, they would not open and close with truth, and to insure this they are made with cogs, or teeth, on the connecting piece and on the joint part of each of the brass straps, which for this purpose are finished off to a curve, of which the joint pin is the centre. The claim is to "the cogs or teeth in double centered joints, to insure the accurate and equal turning upon each centre, in the process of opening and closing the joint, and to keep the parts of the joint in their due positions when at rest either closed or opened."

This construction is ingenious in its application to rules, but we are apprehensive that, when its greater complexity, and liability to be out of order, are taken into the account, it will be found to be more curious than useful.

368. For an improvement in the *Reaction Water Wheel;* Nelson Johnson, Erwin Centre, Steuben county, New York, November 23.

This, so called, improvement, is at least an addition to the number of reaction water wheels on record; it does not, however, pretend to much originality, and we apprehend that its deficiency in this point will not be made up by a superabundance of utility. There is to be a bulk head into which the water is to be admitted at top, whence it is to pass through two reaction water wheels on opposite sides of it, the bulk head being perforated to receive them. The perforations are to be conical, or funnel shaped, and to these the wheels are to be adapted. The invention claimed is the "making the outer and inner rims of the reaction wheels, between which the buckets are placed, in the shape of a section of a cone."

369. For an improved mode of *regulating the motion of the Yarn Beam in the Power Loom;* Welcome A. Potter, Cranston, Providence county, Rhode Island, November 23.

Most of the appurtenances to looms are of a nature not to be readily described in words, although they may not appear intricate when seen by those acquainted with such matters. The claim would not throw any light upon the construction of the apparatus which is the subject of the above named patent, and it is, therefore, omitted.

370. For an improvement in the *Plough;* Bancroft Woodcock, Mount Pleasant, Westmoreland county, Pennsylvania. First patented June 14th 1837. Patent surrendered and reissued November 23.

What I claim in reference to the share is the making it with plain surfaces instead of curved ones, continuing those surfaces with a shoulder on each side, so as to leave the metal throughout so thin that when it wears off by use, the share will still present a thin edge to the ground. I claim also the reversing cutter received into a recess on the land side, and capable of having either of its edges presented forward so as to form the cutting edge of the plough, and secured in its place, on the land side by a wedge, or wedges, or in any other manner which may be preferred. I likewise claim the mode of forming the renewable point, as set forth, and the dovetailed or acute angular form given to the shank of the renewable point, for the purpose of clasping, or holding down the renewable cutter."

371. For improved *Mills for Grinding Grain, and other articles;* Elijah S. Curtis, city of Boston, November 23.

The specification of this patent, with an engraving, is expected to be published in the next number of this Journal.

372. For an improvement in the *Steam Boiler;* James M. Whittimore, Brighton, Middlesex county, Massachusetts, November 23.

This is a vertical cylindrical boiler, with a furnace occupying its centre, as in many other steam boilers. The water surrounds the fire, the cylinder containing it extending down to the top plate of the ash pit, which is constructed in the ordinary manner; but it is, also, to constitute a wind box, into which air is to be blown by means of a wind wheel. The vertical cylindrical boiler is surrounded by two other cylinders, the spaces between which are for a descending and ascending flue, for the heated air; they extend down to the ash pit plate, and each of them has a top, or cover,

either flat or convex, forming flues connected with those formed by the cylinders. The heated air ascends through a pipe in the centre of the furnace, extending into the inner flue space, down which it descends until it reaches near to the bottom, where there are holes admitting it to pass through into the outer space, up which it ascends, and escapes by the chimney. The claim is to the construction and combination of the flues, &c. as set forth.

We are at a loss to discover the advantage of the outward draft space in which the heated air is not in any part in contact with a surface exposed to the water of the boiler. The novelty of construction is but small, and where it exists we are unable to discover utility.

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373. For an improvement in *Wind Mills;* Jacob D. Makely, Cairo, Greene county, New York, November 23.

There is a peculiarity in this wind mill which we believe gives to it a claim to novelty; it consists in making separate foundations for the part sustaining the wings, and that containing the stones, or other machinery to be driven. The patentee says, "I do not claim the principle of placing a wind wheel and its frame upon a circular railway, nor of drawing the surface of the vanes in the wind by cords and pulleys, and regulating the same by weights. But what I do claim is the method of constructing the wind wheel with its frame and swivel placed on a circular railway on the ground, and detached from the building containing the machine or mill to be propelled; the whole combined substantially as herein described. Also the long mortise in the shaft, and the sliding belt, bar, and rod, combined with the other parts for regulating the vanes, as described."

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374. For an improvement in the machine for *Thrashing and Winnowing Grain;* Moses Davenport, Phillips, Somerset county, Maine, November 23.

The claim is to an "endless revolving elevator, with the inclined board which conveys the grain to a fan placed below the thrashing cylinder, in the manner described."

This thrashing machine does not differ from others; the elevator is an endless apron consisting of straps passing round rollers, and crossed by slats which sustain and carry off the straw, whilst the grain falls through upon an inclined board, which conducts it to a fan wheel. The novelty is very small, as will be seen by those conversant with what has been previously done, in the construction of similar machines.

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375. For a *Pistol Sabre;* Robert B. Lanton, city of New York, November 23.

This is another addition to the means of killing our fellow men with great facility. "The principal feature of the invention consists in combining a number of pistol barrels in a revolving cylinder, with a sabre in the centre, on the shank of which the cylinder revolves, between it and the handle, the barrels being caused to revolve by the movement of cocking, in a manner hereafter described."

"The invention claimed by me, and which I desire to secure by Letters Patent, consists in combining a revolving cylinder of parallel barrels, with a sabre, in the manner described, and causing it to revolve

on the shank of the latter, between the shoulder and handle; and the method of turning the cylinder of barrels, as set forth, by the movement of cocking the hammer."

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376. For an improvement in *Spring Saddles*; Harman C. Fisher, Warwick, Kent county, Rhode Island, November 25.

"What I claim as my invention, is the application to mens' and womens saddles, of spiral springs between the saddle tree and pad, as described; using for springs any metal which will produce the intended effect."

The spiral springs are to be placed between boards, &c. and are to operate in the manner of those used in sofas, carriage seats, &c.

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377. For an improvement in *Spring Saddles*; John D. Payne, Warm Springs, Bath county, Virginia, November 25.

"This improvement consists in two taper, curved, flat steel springs over the seat of the common saddle, placed side by side, and fastened by screws passing through the smaller ends into the pummel of the saddle, the wider ends resting upon the cantel, and having slats or oblong mortises in said wider ends, which move over the shanks of screws inserted into the cantel to keep said springs in their proper places."

"The invention claimed consists in the before described arrangement of curved, flat, tapered springs, extending from the pummel to the cantel of the saddle above the ordinary seat, fastened permanently by the smaller ends to the pummel, the larger ends moving freely over the cantel, said springs being covered with a padding, forming a second seat above the covered seat of the common saddle."

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378. For an improved *Mill for grinding Bark, Corn, &c.*; Charles Parker, Meriden, New Haven county, Connecticut, November 25.

This is an iron, or steel, mill, with a conical nut running in a corresponding rim. The only peculiarity in it consists in having the lower edge of the nut so formed that it shall constitute a toothed wheel, and be driven by means of a pinion upon a shaft adapted to that purpose.

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379. For an improvement in the machine for *Ginning Cotton*; F. Goodell, E. Brown, E. Tracy, and L. H. Mosely, assignees of John Stevens, Poughkeepsie, Dutchess county, New York, November 25.

This improvement is on the roller gin, for long stapled cotton. Various materials have been tried to constitute the surfaces of rollers for such gins; it being necessary that the rollers should take hold of the cotton with sufficient force to separate it from the seed, whilst it shall not adhere with such tenacity to the rollers as to be carried round by them, and in consequence become entangled. Most commonly the rollers have been made either of wood, or of metal; in the present instance one of them is made of metal, and grooved upon its surface spirally from the centre towards either end, so as to direct seed cotton along it; the other is formed of disks of cork, passed upon a suitable iron shaft, and pressed together by screw nuts so as to form a hard elastic surface, which is then to be made true and even. The claim is to "the application and manner of making the cork rollers, and the spiral grooved metallic rollers."

380. For an improvement in the *Machine for Ginning Cotton;* Lucilius H. Moseley, Poughkeepsie, Dutchess county, New York, November 25.

The design of this gin is the same with the foregoing; the only difference being in the employment of other materials to effect the same purpose with the metal and the cork in the former. Instead of the cork, disks of paper are to be pressed on to a shaft, as is done on calendering, and sometimes on paper, mill rollers. On the other rollers the surface is to be formed either of stone, or of baked clay, with a surface like biscuit, or hard unglazed earthenware. The claim is to the application of paper, stone, and burnt clay, as rollers for cotton gins.

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381. For a *Horse Power;* Benjamin Hinkley, Fayette, Kennebec County, Maine, November 25.

A circular railway is to be made, about ten feet in diameter, an edge-rail of iron being affixed to its upper surface. A wheel, or platform, somewhat smaller in diameter than the iron rail, is to carry on its periphery a number of rollers, grooved to adapt them to the edge-rail, and turning upon suitable gudgeons. Over these is another circular platform, about twelve feet in diameter, upon the surface of which, near its periphery, the horse, or horses, are to be placed, there being suitable rails to keep them in place, and to which to attach them. The platform may be grooved on its edge to receive a band, by which whirls or pulleys, may be driven. The claim is to "the wheel of truck rollers, in combination with the circular revolving platform, or horse wheel."

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382. For an improvement in the apparatus for *Boring the Hubs of Wheels;* James Hinds, Troy, Rensellaer county, New York, November 25.

This tool consists of a mandrel, one end of which is to be received upon a centre screwed into the latter mandrel, the other being sustained by the front centre. This mandrel may be made square, or it may be round and have a feather along it, as it is to form the slide of a tubular piece of steel, or iron, which is to fit it truly, but not to turn upon it; this tube is to be enlarged at one end, so as to be mortised out to receive a cutter, in the usual way. The wheel to be bored, is secured upon a face chuck; a dog may then be fastened on to the sliding tube, at a distance from the cutter, its projecting part bearing upon the lathe rest, when by turning the lathe, and causing the cutter to advance, the boring will be effected. If the hole is to be taper, the front centre is to be placed in a corresponding sink, or prick punch hole, out of the centre of the mandrel upon which the cutter tube slides. The claim is to a tool constructed in the manner above described.

Whether there is here enough of novelty upon which to sustain a patent is a doubtful point. Straight and taper holes have been bored by means very similar to, and producing the same effect with, that described.

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383. For *Springs for Wagons, Carriages, &c.:* Porter Hill, Veteran, Chemung county, New York, November 25.

These springs are to consist of curved bars of steel, so arranged that the convex part of one of the bars shall bear upon a similar convexity

upon another. Different modes of so arranging them are presented by the patentee, but we do not think it necessary to take the time and trouble necessary to explain them. If they ever come into general use our readers will see them for themselves.

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384. For an improvement in the mode of *Weaving Hair Seating;* Charles R. Harvey, Poughkeepsie, Dutchess county, New York, November 25.

The claims made are to "the particular manner of operating and working the hook, by the transverse cam, and its connecting fixtures. Also the general arrangement of the loom, most of the parts being old, and common methods, but in this loom so combined as to produce a new result, to wit, the weaving of hair seating by a power loom." This we shall not be expected to describe.

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385. For improvements in the *Figure Power Loom;* William Crompton, Taunton, Bristol county, Massachusetts, November 25.

As respects verbal description, all looms are pretty much in the same predicament; they require to be seen, in order to their being understood. The claims in the present instance are to "the entire manner of constructing and combining the apparatus for working the jacks, as described, consisting of the lifting and depressing rods; the rods with rollers for throwing out the jacks, arranged upon a cylinder, or otherwise, the lifting rods, and the upper shaft with its connexion by gearing with the roller cylinder. Also the two notched wheels upon the upper shaft, as constructed, combined, and used, for working the pick."

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a Patent for the manufacturing of Colouring Matter, applicable to Dyeing, Staining and Writing; granted to HENRY STEPHENS, *of Great Britain, October* 25, 1837.

To all whom it may concern, be it known, that I, Henry Stephens, a subject of the Queen of Great Britain, and now residing in Charlotte street, in the Parish of St. Mary-La-Bonne, and County of Middlesex, in the said Kingdom, have invented or discovered a new and useful invention of certain improvements in manufacturing colouring matter, and rendering certain colour, or colours, more applicable to dyeing, staining and writing. And I do hereby declare, that the following is a full and exact description thereof:

My improvements in manufacturing colouring matter, and rendering certain colour or colours more applicable to dyeing, staining and writing, consists in the first place, of improvements in making or manufacturing the Ferro Prussiates (that is, Prussiates of Potash and Soda;) and secondly, in rendering Prussian Blue soluble, and thereby more applicable than heretofore to the purposes of dyeing, staining, colouring and writing, which improvements I am about to describe under different heads or sections, (that is to say,) My first improvement consists in converting certain gaseous products arising from the present mode of making Prussiate of Potash or Soda from animal matter (which are now commonly allowed to escape into the atmosphere)

to the purpose of making Prussiate of Potash or Soda, so that an increased quantity of Prussiate of Potash or Soda may be obtained from a given quantity of animal matter. For the better explanation of this part of my invention, I refer to the annexed drawings, in which Fig. 1.* represents an apparatus for effecting the process of converting the gas evolved into prussiate—*a*, is an iron pot, vessel, or retort, charged with alkali and animal, or other, matter, containing azote, or yielding ammonia, which vessel is to be heated to a low-red heat. This pot, or vessel, has a movable cover which is to be luted on when under operation, but may be removed and placed upon another pot, *b*, by disconnecting the joint in the pipe, *c*, the joint allowing the head of the pipe, *a*, to be carried round with the connecting pipe *c*. The pipe *c*, is for conducting the gaseous products arising from the decomposition of the said animal matter in the pots *a* or *b* into an iron, cylindrical, or other conveniently shaped, vessel, *d*, heated by a furnace, *h*, below. This vessel, *d*, is to be charged with alkali, and to be kept at a full red heat during the operation; *e*, is a pipe leading from the cylindrical vessel to a closed vessel, *f*, containing a solution of alkali. This vessel is furnished with a jet pipe, or burner, *g*, which is merely intended as a gauge cock, to ascertain the state of the gas within—*i*, *i*, are furnaces under the pots *a* and *b*. The gas generated in the retort, *a*, passes by the connecting pipe, *c*, to the cylinder, *d*, where meeting with the alkali in a state of fusion, the effect will be that the gas becomes combined, to a certain degree, with the alkali and forms Prussiate of Potash or Soda. But there may be portions of the said gas which do not combine, or commix, with the alkali; these will pass off by the pipe *e*, to the closed vessel, *f*, and if any of the gas thus passed off should be capable of combining with the alkaline solution, it may do so in the closed vessel, *f*, and that portion which does not combine with the alkaline solution is allowed to pass off by the gas jet-pipe, *g*; the state of operation may be ascertained by burning the jet gas from the end of this pipe, for when it ceases to burn freely, the connexion between the pot, *a*, and cylinder, *d*, should be disconnected, and the head and pipe, *c*, be removed round and luted on the pot, *b*, which is to be previously charged with animal matter and alkali, the distillation of which will proceed as before described. When the gaseous products of several charges have been passed through the cylinder *d*, containing the alkali, the cylinder may be opened and the charge (which will now consist of crude Prussiate of Potash or Soda—or "metal" as it is commonly called in the trade,) be withdrawn into an iron vessel, and when cold be lixiviated in cold water in the usual manner. The further decomposition of the charge of animal matter, in the pot, *a*, may now be conducted in the ordinary manner of making Prussiate in the open vessel by increasing the heat, the contents to be agitated as usual. This process may be repeated alternately in the two pots, *a* and *b*, the completion of the decomposition of the charge of one being effected, while that of the other is subjected to the lower heat, and the operation of distilling off its vapours and passing it to the retort, or vessel, *c*.

A similar effect, (viz.) that of taking up the gaseous products so as to produce an additional quantity of crude Prussiate of Potash, or "Metal," may be obtained in an open, conical chimney, having a false bottom, or grate, or perforated plate, upon which dry potash, or soda, is placed so that the gas generated in the pot below may pass through the stratum of alkali in the chimney.

Fig. 2. is a sectional elevation, representing this application of my im-

* These figures are not given, as they are such as are ordinarily used by chemists.

provement: E, is the chimney, or open cone, usually placed on the top of an ordinary pot, F. for making Prussiate of Potash, in order to convey the flame upwards. G. is a grating, or perforated plate, placed at the base of the cone, E. Upon this grating, or perforated plate, G, a stratum of dry Potash, or Soda, is laid, and as the gas passes upwards through this stratum, a portion of it will become combined with the alkali. The chimney, with the stratum of the alkali, may be removed when the flame begins to burn weak, and it may be set aside and applied to future charges, or put into the pot and worked off with the charge in the usual manner of making Prussiate of Potash or Soda.

My second improvement, (viz) the mode, method, or process, of treating, or operating upon, Prussian Blue, so as to render it more perfectly soluble, or more readily disposed to be acted upon by the subsequent process of solution, than when manufactured in the usual way, and in order that the same may be more applicable to the purposes of dyeing, staining, colouring and writing, I effect in the following manner:

I take the Prussian Blue, whether produced from a combination of Prussiate of Potash and Salts of Iron, or the Prussian Blue of commerce as commonly manufactured, and I put this into an earthen vessel and pour over it a quantity of strongly concentrated acid, sufficient to cover the Prussian Blue; Muriatic acid, Sulphuric acid, or any other acid which has a sufficient action upon iron, will do, but I prefer the Muriatic acid. If Sulphuric acid is used, it should be diluted a little, that is a quantity of water equal to about its bulk, at the time when the mass burns white after the Prussian Blue is put in. The Prussian Blue is to be allowed to remain in the acid from 24 to 48 hours, or longer. I then dilute this mixture with a large quantity of water, stirring it up at the time, for the purpose of washing from it the Salts of Iron. When in this state of dilution, I suffer it to stand until the colour has subsided, when the supernatant liquor is to be drawn off with a syphon, and more water added to it, and I continue the repetition of this process until I judge that the acid, with the iron, has been completely washed away, and this is known by testing it with Prussiate of Potash, which will show if it yields any blue precipitate; if not, it is sufficiently washed; I then place it upon a filter and suffer it to remain until the liquid has all drained away.

The Prussian Blue thus prepared is reduced to a state, as I conceive, containing less iron than the Prussian Blue of commerce, in which state it is more readily acted upon and rendered soluble, than in any other condition. This Prussian Blue may be then placed in evaporating dishes, and gently dried. To form the Prussian Blue so operated upon into a solution, I add to it Oxalic Acid, and mix them carefully together; after which I add cold water (cold distilled water is best) a little at a time, making it into a dense or dilute solution, according to the colour required. The quantity of Oxalic acid may vary according to the quantity of water used. It will be found that the Prussian Blue that has undergone this process of digestion, as described, requires but a small quantity of Oxalic acid to dissolve it. About one part of Oxalic acid will dissolve six parts of Prussian Blue, (the weight taken before digesting in the acid.) This will answer for a concentrated solution, but for a dilute solution, more acid will be required. Prussian Blue that has not undergone digestion in acid in the way above pointed out, will require a much larger proportion of Oxalic acid, from twice to three times its weight, and then it will be greatly liable to precipitation after standing; but when treated in the way described, it is not liable to precipitate, but remains a permanent solution.

The chief obstacle to the general employment of the beautiful colour obtained by means of the Ferro Prussiates to the purposes of dyeing in the silk, cotton, linen, or woollen manufactures, and also to the purposes of staining and writing, has been its hitherto supposed indissoluble nature; but by means of Oxalic acid, (whether obtained by the usual process of mixing or distilling saccharine matter in combination with nitric acid, or from vegetable, or other, substances containing Oxalic acid, or from combinations of Oxalates, whether metallic, earthy, or alkaline,) I obtain the above perfect solution of the Prussian Blue, which is applicable to dyeing, colouring, or staining, in the various manufactures of woollens, silks, linens, cotton, paper, and such other substances as are required to be dyed, or stained, and which solution is also available to the purpose of writing, or forming a writing fluid, or ink, to be used with steel, quill, or other, pens.

In conclusion, I desire it to be understood that I do not claim any of the apparatus, or machinery, described, nor the calcination of animal matters in close vessels, but I do claim the method of obtaining a product of Prussiate of Potash, or Soda, from the gases evolved from the distillation of animal matters, or any other matters that yield Azote and carburetted Hydrogen, such, for instance, as coal, by means of passing those gases into the mass of alkali in a state of ignition, and into a solution of alkali contained in separate vessels, either closely, or distantly, connected with the distillatory apparatus.

Secondly—I do not claim the use of acids for the purpose of brightening, or improving, the colour of Prussian Blue in the ordinary manner. But I do claim the use of strong acids for the purpose of digesting dry Prussian Blue of commerce, in order to render it more easily soluble in the Oxalic acid, than it would be without such a digestion. And I further claim the use of Oxalic acid, however obtained, as a solvent for Prussian Blue generally, but more especially, as a final process for making a perfect solution of the Prussian Blue which has been prepared and digested in the manner above described.

HENRY STEPHENS.

Specification of a Patent for a Fire Proof Paint; granted to LOUIS PAIMBŒUF, *City of Washington, D. C., November* 11th, 1837.

To all whom it may concern, be it known, that I, Louis Paimbœuf, of the City of Washington, in the District of Columbia, have invented an improved mode of preparing Paint for the protection of buildings against fire; and I do hereby declare that the following is a full and exact description thereof:

My fire-proof Paint may be prepared by grinding and incorporating the ingredients used, either with oil, or with water as may be preferred. That prepared with water or other aqueous fluid, however, has one advantage over that prepared with oil; namely, it dries very rapidly, and affords the desired protection immediately; whilst that prepared with oil, will not harden until the lapse of several weeks, depending upon the season of the year.

To prepare my paint, I take the best quick lime, such as when slacked forms an impalpable powder, and slack it by the addition of so much water, only, as is requisite to produce that effect, performing this ope-

ration in a trough, or vessel, which may be covered over, so as to retain the vapour and heat as perfectly as possible, as upon this procedure I find that much of the effective strength of the composition is dependent.

When the slacking has become perfect, and the mass has cooled, I, in order to prepare my water paint, add either water or skimmed milk, or a mixture of the two, to the lime, in sufficient quantity to give to it the consistency of cream, or that of ordinary paint. When milk is not used, I add to the water a quantity of rice paste, made by boiling rice in water to a proper consistence, using about eight pounds of rice to every hundred gallons of the prepared paint. To every hundred gallons of this prepared lime mixture, I add twenty pounds of alum, fifteen pounds of potash, and one bushel of common salt. These are the essential ingredients, and the proportions such as I have found to answer well. If the paint is to be white, I find it advantageous to add to these ingredients about six pounds of prepared Plaster of Paris, and the same quantity of fine white clay. When the paint is not required to be white, I substitute clean, well-sifted, hard-wood ashes for the potash; about two bushels being sufficient for the above quantity; in this case, also, I frequently add three, or four gallons of molasses.

After mingling these ingredients, I first strain them through a fine strainer, and afterwards grind them together in a paint mill, when the paint is ready for use. When roofs are to be covered, or when crumbling brick walls are to be coated, I mix with my paint a quantity of fine white sand, in the proportion of about one pound to every ten gallons of the paint, as this addition will cause the paint to petrify, preventing leakage in roofs, and binding the crumbling particles of disintegrating brick work.

In applying this paint, excepting in very warm weather, it will be advantageous to use it as warm as it can be conveniently kept; and particular care must be taken that it be not allowed to freeze whilst drying, as its binding property would thereby be destroyed, or much impaired. Three coats will be sufficient in all cases. In putting on the first coat, the paint should be more diluted than with the others. It can be managed by any person used to the paint brush.

When the oil paint is to be prepared, I take forty gallons of good, boiled, linseed oil, and to this I add such quantity of the fine, dry-slacked lime as is requisite to bring it to a proper consistence for paint, and to this add two pounds of alum, one pound of pot, or pearl, ashes, and eight pounds of common salt. In this paint, good wood ashes may be substituted for the potash, eight, or ten pounds being used.

This paint is to be used in the same manner as other paint, taking special care that the first coat is perfectly dry before the second is applied. Under the same circumstances, the addition of a portion of white, fine sand, will produce a like good effect as in the water paint.

With these paints any of the ordinary pigments may be used, so as to obtain any colour which may be desired.

I do not claim to be the first who has applied the above-named ingredients to the purpose of rendering wood incombustible, either separately, or, to a certain extent, in combination with each other; but what I do claim as my invention, or discovery, is the combining together of lime, potash, alum and common salt, substantially in the manner herein set forth; whether the same be in the proportions herein designated, or in any other which will produce a like effect, and whether the other

ingredients named, or any similar substances, be added to the water, or the oil paint, prepared as above. LOUIS PAIMBŒUF.

Remarks by the Editor.—When the foregoing composition was first introduced in the city of Washington, it attracted considerable attention, in consequence of some public exhibitions made for the purpose of showing its efficacy, and which were, so far as they went, satisfactory. The small, wooden erections upon which these experiments were performed, had been recently, and very carefully, covered with the composition, and the question was one of much importance, how long will the protective effect continue? Will the paint, or work, stand exposure to the weather, or will it wash, or shell off? To these questions the reply of the experimenter was, that he had roofs covered with it in the West Indies, and that it was good after a lapse of five years. This assurance induced a number of persons to make essays with the material, and it was soon found that it would both shell and wash off, at an early day, and that it was, consequently, of no value whatever. Prior to this, the nature of the composition had not been made known, but an application for a patent necessarily called forth the recipe.

Those who are acquainted with the many experiments which have been instituted for the purpose of rendering timber fire proof, will not meet with any thing substantially new in the foregoing plan; all the essential ingredients, as well as many others, analagous in their properties, have been essayed, and the result made public. The propriety of granting a Patent was questioned, but it was considered as limiting the patentee to his own particular combination of ingredients, by which the public interest would not be invaded. Twenty compounds equally good, and some better, may easily be prepared, were they worth preparing. Had that in question been faithfully made, by a proper incorporation of the ingredients, and the employment of a sufficient portion of those which were known to be the most beneficial, the eventual failure would at least have been postponed, and would have been less complete.

Specification of a Patent for a Machine for separating Garlic from Grain; granted to HENRY STRAUB, *Shepherdstown, Jefferson County, Virginia, November 11th*, 1837.

To all whom it may concern, be it known, that I, Henry Straub, of Shepherdstown, in the County of Jefferson, and State of Virginia, have invented an improved Machine for separating Garlic from Wheat, or other small grain, and which will be found applicable to other purposes; and I do hereby declare that the following is a full and exact description thereof:

A cylinder is made to revolve, within a frame, by any suitable means. This cylinder, I cover over its whole periphery, with elastic teeth of wire, or with narrow elastic strips of metal, secured upon it by any suitable means. This wire, or these metallic strips, must be of such strength as will enable them to crush the heads of garlic, and reduce them into small fragments. The size of such wire, or strips, must be regulated by the material of which they are made; iron teeth for example, will require to be stouter than those made of steel. I usually make them

about an inch long, but it may be found advantageous to vary this according to the size of the machine, and other circumstances. These teeth, of course, surround the cylinder.

A concave extends about one-fourth of the way round the cylinder; this is formed of rods, or strips of iron, of such thickness as shall be sufficient to preserve them from bending; the strips extend from side to side of the machine, and are placed so near to each other as not to allow a sound grain of wheat to pass between them; they are to have stays between them at suitable distances, to prevent their springing. I employ a feed board, down which the grain is allowed to run, and by which it is fed, in between the revolving cylinder and the concave. The edges of the strips should be square, and their angles sharp; and the teeth on the cylinder must be very nearly in contact with them.

In operating with this machine the heads of garlic, being softer than the grain, will be broken up by the action of the teeth against the concave of iron slats, between which the larger portion of the fragments will pass, and those which may fall down with the grain may be readily separated by screening.

What I do claim as my invention, and desire to secure by Letters Patent, is the separating of Garlic from Grain by passing the same between a revolving cylinder, and a concave of iron, the cylinder being covered with teeth, and the concave formed of strips, in the manner herein set forth.

HENRY STRAUB.

Specifications of a Patent for an improved Apparatus, which may be used as a Life Boat, and for other purposes; granted to JOHN MACINTOSH, *City of New York, November 11th,* 1837.

To all whom it may concern, be it known, that I, John Macintosh, of the City of New York, have invented a new and improved Apparatus which may be used as a Life Boat for the saving of persons and property, for the conveyance of troops, baggage, and other articles, across rivers, &c., and for various other useful purposes; and I do hereby declare that the following is a full and exact description thereof:

I take canvas, or other flexible material, and render it impervious to water by means of a solution of caoutchouc, or in any other of the known ways of effecting this object; and of this flexible material, so saturated, I make my vessel, which is to contain the persons, or things, intended to be buoyed up, and conveyed upon the water. Such a vessel may be made to assume a variety of forms, dependent upon the purpose for which it is to be used, whether for one or more persons, the transportation of troops and baggage, and for other objects. The manner in which I intend, most commonly, to construct such a boat, or vessel, is the following:

I take a square piece of canvas, or other material, saturated as above stated. The edges are to be turned over, in the manner of forming a wide hem, so as to leave what, when filled with air, will become a tube, or air-chamber; the turned-over edges being securely cemented down, taking care that the juncture is air-tight. The material is then doubled over, so as to bring the opposite edges together; and the edges of the doublatures are united by cementing, or otherwise, as are also the edges

of the tubes, or air-chambers, so as to cause them to form a continuous air-tight rim, when, if the sides are separated to some distance apart, it will constitute a vessel resembling a boat. A small hose, or tube, furnished with a stop-cock, leads into the air-chamber, which may be inflated in a few moments by applying the mouth to the stop-cock. Instead of a single air-chamber, there may be two or three, one immediately under the other; when, should one be accidentally ruptured, no inconvenience would result therefrom.

It will be evident that a vessel so constructed will float in the water from the buoyancy derived from the air-chamber, and that its lower, or bag part, will also remain at the surface, or nearly so; but if persons, or any weighty articles, are placed upon this part, it will sink so as to displace a portion of water equivalent in weight to itself, if its specific gravity be not greater than that of water, and that in this way, it may be loaded, whilst the tubular part, or air-chamber, will remain at the surface, occupying the situation of the gunwale of a boat.

To form a covering to the persons, or things, contained in the vessel, pieces of air-tight canvas, or other material, may be attached round the air-chamber, and may be folded, or drawn, over the persons, or things, contained in the vessel. In some cases, it may be found desirable to leave an air-opening in the covering, which opening may be surmounted by a conical tube, or other device, for admitting air, and keeping out water.

Oars, or paddles, may be used to give a direction to such vessels; and where, for the conveyance of troops, or for any other purpose, a number of them are to cross any water, a tow-line may be carried by the first, and employed to draw the others over. For the purpose of using oars, there should be thongs, at suitable places along the edges, which, when tied together, will form loops through which the oars may pass. Other devices for propelling may be used; as, for example, a triangular, or other, float board, having a line attached to it, in the manner of a log line, may be thrown out by a person in the vessel, when by drawing the line, the vessel will be propelled, or drawn, towards the float board.

By means of thongs attached to the edges of the air-chamber, the sides of the tubular air-chamber may be made to approach each other in any part desired, and any required form be given to the outline of the vessel, by merely tying these thongs together.

Where it is desired to apply the principle to ships, steam boats, &c., the bag part need be but little larger than will suffice to contain one or two persons only, and such articles as they may desire to have with them, this may be effected by having the berth matrasses of any ship, steamboat, &c., cut into two parts lengthwise, and covered with caoutchouc, or with other water-proof flexible material, as aforesaid, to take the place of tubes, with the bag of the aforesaid material, placed between the two parts of the matrass; and in this case, it will be found convenient to attach flexible legging to the bottom of the bag to receive the legs and feet. A person may then carry the whole in his hands, walk about readily, and jump from a vessel, or wharf, into the water, and when there, may use his feet and legs to enable him to swim backwards.

With an apparatus of this kind, a covering may be used which may be drawn round the neck, over the head, or under the arms, of the person, as may be desired; and, indeed, this and other parts of the apparatus are susceptible of numerous modifications, which, as they are de-

pendent upon the judgment, or the fancy, of the person using it, it would be impossible to enumerate.

When the matrass of a vessel is used to form the gunwale of the Life Boat, such matrass may be made in two thicknesses, which, when used as a matrass, lie upon each other, but when opened out, will form the gunwale, the bag part depending from its lower edges. Or, the matrass may be cut into two parts, along its middle, so as to consist of two narrow matrasses of half the usual width, which lie side by side when in the berth, but when used as a Life Boat, then open out, the bag, as before, depending from their edges; in this case, as the two parts of the matrass are not continuous, they are to be connected by water proof ends, consisting of cloth which may be drawn up in any convenient way. This mode of using the matrass I prefer; the gunwale part being, in this case, of half the width and double the thickness of that first described, which I find to be advantageous.

What I claim as my invention, and wish to secure by Letters Patent, is the constructing an apparatus, or vessel, wholly of such flexible materials, as are herein described; one portion of which material shall constitute an air-chamber, or air-chambers, which may be readily inflated by the mouth; or made of any flexible article whose specific gravity is less than that of water; such as the materials which are commonly used in ship's berth matrasses, and filled with hair, straw, &c.; whilst the other portion thereof shall contain a bag, or receptacle, to contain persons, baggage, goods, ammunition, &c.; and this I claim, whatever be the form given to such vessel, bag, or receptacle, or to any covering which may be used therewith, whilst it is constructed so as to operate substantially in the manner, or upon the principle, herein set forth.

JOHN MACINTOSH.

Progress of Practical and Theoretical Mechanics and Chemistry.

Protection of Iron by Zinc.

The invaluable discovery by M. Sorel, of an effectual and cheap method of preserving iron from rust, or corrosion, by zinc, described at page 52 of the present volume, has occasioned the formation of a Galvanized-metal company for the manufacture of zinced Iron, and the extension of its use throughout Great Britain. The happy solution of this long sought chemical problem, which will doubtless be productive of immense economy in the use of a metal, the demand for which must continually increase faster than the possibility of its adequate production, must hereafter constitute, like the steam engine, one of "the most valuable presents from philosophy to the arts." The following testimonials to the soundness of the principle and value of the discovery, are from the prospectus of the English, Scotch, and Irish Galvanized-metal Company. G.

M. Sorel, a French chemist, after many years of study and experiment, discovered an application of a scientific principle for preventing the oxydation or destruction of metals, particularly iron, as effectual as it is simple and inexpensive. His discovery is protected by a patent in France where, for some

months, the process has been in successful operation. Patents have also been granted for the invention in the United Kingdom.

The discovery has been submitted to the consideration of the following eminent British chemists:—W. T. Brande, F. R. S., Professor of Chemistry to the Royal Institution; J. G. Children, F. R. S.; Thomas Graham, Professor, London University; A. Garden, M. R. I.; Richard Phillips, F. R. S.; and such of the Reports of those gentlemen as have been received are annexed.

By Professor Graham, of the London University.

The effect of zinc in protecting iron from oxydation has been known to chemists for some time. When these two metals are in contact, an electrical or galvanic relation is established between them, by which the iron ceases to be susceptible of corrosion by dilute acids, saline solutions, or atmospheric humidity. It was found in experiments lately conducted at Dublin and Liverpool, that small pieces of zinc attached to each link of a chain cable were adequate to defend it from corrosion in sea water. The protection was observed to be complete, even in the upper portion of the iron chains by which buoys are moored, and which, from being alternately exposed to sea water and air is particularly liable to oxydation, so long as the zinc remained in contact with the iron links. The protecting influence of the zinc could not be more certainly secured than in the articles prepared by the patent process, the iron surface being uniformly coated over by that metal. In trials, to which I have had an opportunity of subjecting them, the iron escaped untouched in acid liquids, so long as a particle of the zinc covering remained undissolved. The same protection is afforded to iron in the open atmosphere by zinc, with a loss of its own substance, which is inappreciably minute. The zinc covering has the advantage over tinning, that, although it may be worn off and the iron below it partially exposed, the iron is still secured from oxydation by the galvanic action, while the smallest quantity of zinc remains upon it; whereas tin in common tin-plate, affords no protection of this kind, and not being absolutely impermeable to air and moisture, the iron under it soon begins to rust in a damp atmosphere. The simplicity and perfect efficacy, of the means employed to defend iron from the wasting influence of air and humidity in this process of zinc-tinning, certainly entitle it to be ranked as one of the most valuable economical discoveries of the present age.

THOMAS GRAHAM,
Professor of Chemistry.

University College, London, April 17th, 1838.

Jointly by J. G. Children, Esq., F. R. S., &c., and A. Garden, Esq., M. R. I., &c.

The so-called galvanized iron consists of iron coated by zinc. The process by which the union of these two metals is effected we are ignorant of, as we have not seen a copy of the French patent, but we conclude that it is somewhat similar to that by which iron is coated with tin, since, that zinc may be so employed instead of the latter metal was pointed out by the Messrs. Aikin in their Dictionary of Chemistry, as long ago as the year 1807. The method adopted by Sir H. Davy, for protecting the copper sheathing of ships by means of some metal whose electrical relations are positive with respect to the copper, may have suggested the idea of a similar protection to iron, and it is obvious to theory, and demonstrated by fact,

that zinc is an incomparably more powerful agent in producing that effect than tin. A material difference, however, exists between the French invention and that of Sir H. Davy, since the English philosopher employed *contact* of the metals only in protecting copper; whereas Monsieur Sorel avails himself of the chemical (or electrical) affinity of the metals in the most extensive and perfect contact in protecting iron.

Certain specimens have been shown to us as the results of comparative experiments made by exposing articles formed of galvanized iron, and similar articles of tinned iron, and of iron in an uncovered state, for several months, to the influence of the atmosphere, in which the iron of the first remains unaffected, whilst that of the two latter is very much oxydated. Time has not been allowed us to repeat this, the most simple and most conclusive, experiment; but those which we have been enabled to make in the short interval that has elapsed since our opinion on the merits of this invention has been demanded, give us every reason to believe that the results alluded to have been honestly obtained, and that they afford decisive evidence of the efficacy and importance of this method of protecting iron from rusting influences.

The experiments we have made consisted in exposing plates of galvanized iron, and similar plates of tinned iron, and of iron altogether unprotected, in separate vessels, to the action of distilled water, a solution of common salt of about the same strength as sea-water, and of diluted muriatic acid. In every case, the unprotected iron and the tinned iron were acted on and oxydated in a very few hours, and in three days abundance of red oxyde of iron was found to have been deposited in each vessel containing the iron plates and the tinned iron plates; but in those containing the galvanized iron not the slightest trace of red oxyde could be detected, and, except an almost imperceptible discolouration of the zinc surface, which in one or two instances had become a little darker, the galvanized iron was entirely unchanged. A piece of galvanized iron plate and of simple iron plate were also placed *in contact with each other* in distilled water, and another similar pair in a solution of common salt. In three days neither plate showed any symptoms of the iron having been oxydated, so that the protecting power of the zinc of the galvanized iron plate appears to have extended to the iron plate in external contact with it also. It had been suggested to us that perhaps accidental or partial abrasion of the zinc surface might occasion the iron to rust into holes where unprotected. We did not think this likely, nevertheless we put it to the test of experiment, and with a file cut lines into the galvanized plate entirely through the zinc, so as to leave the surface of the iron exposed, and did the same with a plate of tinned iron. In every instance the lines in the latter were filled in a day or two with red oxyde of iron, whilst those in the galvanized iron plate retained their undiminished metallic brightness. We did more,—we dissolved off every particle of zinc from two portions of the galvanized plate—in one case by very dilute muriatic acid, in the other by equally dilute sulphuric acid. As soon as the whole of the zinc was removed, the solution was poured off, and a portion of it, to which some nitric acid was previously added, was tested for iron by pure ammonia; when the only evidence that any portion of the latter metal had been dissolved was a very faint reddish tinge which prevailed through the liquid, but so slight as hardly to afford a sensible precipitate of light flocculent particles, after considerable repose. With the evidence of these facts before us, we can have no hesitation in stating our opinion that this method of protecting iron from rust will prove of infinite service in a variety

of arts, and will admit of economical application in numerous ways, as the roofing of buildings, sheathing and bolting of ships, and a thousand other forms, and entirely supersede the employment of tinned iron, except in vessels used for culinary purposes, in which, we fear, it could not safely be adopted. It is possible that the objection to the use of H. Davy's protected copper for the sheathing of ships, may also prevail against the employment of the galvanized iron for the same purpose,—the increased tendency to foulness from the adherence of barnacles, weeds, &c., to the ship's bottom; at the same time we think it probable that it may not be liable to that drawback; but this question must be referred to the only satisfactory solution—*experiment.*

J. G. Children,
A. Garden.

London, 17th April, 1838.

By William Thomas Brande, Esq., F. R. S.

Royal Mint, 26th April, 1838.

Gentlemen—I have examined the several articles sent to me by your order, under the name of *galvanized iron*, and represented as manufactured of iron in various combinations with zinc. In this way an arrangement susceptible of electric excitation is obtained, in which, consistently with the laws of electro-chemical action, a preservative power is conferred by the zinc upon the other metal; for in all cases in which two different metals are in contact, a current of electricity may be established in them in such a direction as to protect the least oxydizable of the two metals.

In common tin-plate, or tinned iron, the combination is such that the oxydizement, or corrosion, of the iron is accelerated by the tin, so that the *iron* is the *protecting* and the *tin* the *protected* metal; but in the case before us, in which the respective metals are iron and zinc, the reverse effect ensues, the *iron* is here the *protected* metal, and *zinc* the *protector;* and, consequently, when these latter combinations are subjected to the action of water and other agents, the iron is preserved from corrosion so long as any zinc remains to maintain the electrical current.

I have subjected pieces of this prepared iron to the action of distilled water, to rain water, to sea water, to the joint action of air and water, to dilute solutions of sulphuric, nitric, and muriatic acids, and to other oxydizing or corroding agents upon the common tinned plate and upon wrought and cast iron, and, as was expected, the rusting and corrosion of the iron, is in all these cases entirely prevented in the zinced, or patent, plate; whereas, on the other hand, it goes on with more or less rapidity in regard to the unprotected, and the tinned, iron; and as respects the latter, the iron, whenever it is exposed, appears to be more rapidly corroded in consequence of the adjacent tin.

As far, therefore, as under these circumstances the relative durability of the patent iron as compared with either wrought, or cast iron, or with tinned iron, is concerned, permanence is excessively in favour of the former; and there can be no doubt of the great advantage that must accrue in a vast number of the ordinary applications and uses of these substances, in the employment of the zinced, or patent, plate, and in its substitution for any of the usual forms of manufactured iron.

As my experiments have necessarily been limited in regard to time, I cannot speak with certainty as to effects which may possibly ensue from the pro-

tracted action of chemical agents upon the zinced iron; but both theory and experience lead me to believe that so long as the zinc endures, the protection will hold good.

Again, speaking theoretically, I should presume that the zinced plate, or the other forms of the protected iron, would be admirably adapted for roofing materials, gutters, water pipes, chimney tops, packing cases, and all analogous applications in which a light and durable material that will resist the joint action of air and water is required; that it would also be well adapted for certain tanks and cisterns; for the manufacture of a great variety of articles required to endure a damp atmosphere, such as locks, keys, hinges, and so forth; for cellars, warehouses, and all exposed situations; and for the iron-work of bridges, canal locks, and of much other machinery; for the beams and columns of buildings; for clamps, bars, rails, bolts, nails, screws and nuts; for all out-door works; and for many implements in, and parts of chemical and other manufactories. In short these applications are as obvious as they are endless.

On the whole, I regard this as by far the most valuable practical application of the electro-chemical principle of the protection of metals which has hitherto been carried into effect.

I am, Gentlemen,
Your faithful servant,
WILLIAM THOMAS BRANDE.

In addition to which indubitable opinions, the following translated extracts from the French Society are corroborative and interesting.

"Chemists have long attempted to apply electricity by perpetual contact to the preservation of iron; but the means employed were defective and unsuccessful, until the recent discovery by M. Sorel. Sir H. Davy died with the conviction, that the application of the principle was possible, and would some day be attained.

"Science has already given testimony in favour of M. Sorel's process. Messrs. Dulong and Dumas have frequently alluded to it in their addresses to L'Academie des Sciences.

"The following extract is from a Report made to the General Meeting of La Société d'Encouragement, at which Baron Thenard presided on the 5th July, 1837.

"'The experiments of several members of the Committee of the Chemical Arts have proved that M. Sorel's process effectually protects iron from oxydation. It is, therefore, to be expected, that the galvanic coating will soon be applied not only to the sheet-iron but to many of the larger masses of that metal, cast or wrought, which are employed in naval architecture, military implements, and domestic buildings, especially to the iron-work of shipping exposed to the atmosphere, or to salt water; to war projectiles, to masses of iron buried in damp situations, or covered with plaster.

"'The Galvanic Paint is well adapted to all articles of iron exposed to the action of air or water, or both alternately.'"

Extract from the Report of L'Academie des Sciences. Paris, 11th April, 1837.

"M. Dumas read a Report, by which it appeared that various trials had been made by Sir H. Davy and other chemists to preserve iron from rust, but that none had succeeded. He at the same time read a

letter from Captain Born, (of the Artillery of France,) addressed to the Academy, calling their attention to the vast importance of this discovery in its applicability to military purposes only. In giving the substance of Captain Born's letter, M. Dumas said, 'the military and naval artillery had a stock of 7,734,000 projectiles of the value of 26,000,000 francs (1,100,000*l.* sterling.) According to Captain Born's estimate a pile of cannon balls, after twenty years' exposure to the open air, are almost all unfit for service. If it be admitted, as it must be, that the value of a projectile, sold as cast iron, is not more than one-third of its cost price, then is the importance of this discovery apparent. Supposing that the Government of France should adopt M. Sorel's process the expense of which is very trifling, it then would appear, from Captain Born's calculations, that a saving of 17,333,334 francs, for this part alone of the war department, would accrue in twenty years.'"

The Patent Process may be applied in three different ways, all equally simple:—

1. By coating iron with zinc in a fluid state.
2. By applying a paint made from zinc.
3. By covering with a powder made from zinc.

Under the first process, many articles, not already referred to, will occur to every one considering the subject. Gas-pipes, water pipes, rails, for tram-roads, iron bridges, iron boats, roof-gutters, iron railing, interior of steam-engine boilers, iron sheathing of ships, ships' bolts, &c. On the applicability of the patent process to the three last mentioned articles but little, if any, doubt exists in the minds of our most eminent chemists. The difference in the cost of a seventy-four gun ship between iron and copper would be as 810*l.* to 6480*l.* The saving in her Majesty's Navy and in the Mercantile marine of this country would consequently be enormous.

Under the second process, zinc paint would be employed wherever the bulk of the article to be protected or the difficulty of displacing it would render an immersion of the iron into the heated metal impracticable. Bridges, therefore, already constructed, boats already built, in short all articles already fixed may be preserved from further decay by the use of the patent paint. This paint will not be dearer than white lead.

By means of the third process, the finer sorts of iron and steel will be preserved. All articles of hardware and cutlery are subject to the most serious deterioration by exposure to moisture; but by applying to them the galvanic powder, or wrapping them in paper prepared with it, they may be exposed with safety to any weather, or exported with security to any climate.

It remains only to repeat that the processes are not expensive. However numerous and important are the admitted advantages of these discoveries, they would be less striking were they to be obtained only at a high price. The process of coating with the metal in a liquid state is cheaper than tinning. Tin is worth 98s. per cwt., zinc 20s. per cwt. Supposing that galvanized sheet iron should be sold at the price of tin-plate, the profit would be, at least, 100 per cent. Lond. Mech. Mag.

Blasting by Galvanism.

Mr. Bethell, who for many years past has been engaged in inquiries and experiments on diving, and is the patentee of an improved diving dress, favoured the Institution* on the following meeting, April 24, with the result of his practical experience of the effects of a blast ignited by galvanism. This he had been led to devise by having frequent occasion to blow off the decks of sunken vessels, in order to enable the divers to reach the cargo. We will first describe the usual mode of conducting this operation, which is as follows. The charge of powder is enclosed in a tin canister, and deposited in a requisite position in the wreck. It is lighted by means of a sort of quick match, made of cotton steeped in spirits of wine and gunpowder, and then dried. This match is protected from the sea water by an Indian rubber tube enclosing it, and inserted, water-tight, into the canister. These precautions being carefully taken, the fire is conveyed with tolerable certainty to the charge; but as it runs along, it, of course, blows up the India rubber tube—a very expensive process when the depth of water is considerable.

We will now proceed to describe Mr. Bethell's mode of effecting the same object: we could have wished to illustrate it by a sketch, but are unavoidably prevented by want of time. We will, however, undertake to render the matter clear to any one who has ever seen a galvanic battery in action—perhaps to some others besides. It is well known that a piece of platinum, or of iron wire, when made to connect two copper wires leading from the two poles of the battery, instantly becomes red hot, and capable of igniting gunpowder, or even lighting a spirit lamp. The problem for Mr. Bethell to solve, was just this; to introduce this same piece of platinum, or iron wire into his charge of powder, and keep open, when placed in its situation under water, its connexion with his galvanic apparatus in his boat above. This object he effected as follows:—To consider first his canister; in the top is fixed a cork coated with sealing wax, through which descend, water-tight, two vertical copper wires reaching into the middle of the charge. These are separate during their whole course, except at bottom, where they are connected by a piece of platinum, or of iron, wire; and at top they rise a little way above the cork, and are curled round into two distinct loops. After the charge is introduced, the top is cemented on the canister with putty. This then being all ready for the explosion, let us consider, secondly, Mr. Bethell's chain of communication. Now, here the difficulty is, that we must have not only two wires, but two wires insulated, kept totally distinct as far as their power of communicating the galvanic action is concerned; for this action is wanted in the canister, not in the boat, nor in the sea water. For this purpose Mr. Bethell coats the wires with a non-conductor; the best he considers to be the caoutchouc solution, or varnish, prepared by Macintosh and others. His wire is about as thick as common bell wire, and wrapped round with cotton thread, like the wire which the ladies use for millinery. Two of these cottoned wires are coated with the varnish; when dry they are connected together by thread, and form a galvanic rope, which may be laid by for use, in coils of any necessary length. The wires in the canister are likewise separately covered with cotton, and coated with the varnish; except at the two ends, at the one end of which

*Inst. of Civil Engineers. G.

they touch the platinum connecting wire, and at the other the galvanic rope leading from the boat.

And now, his apparatus being ready, Mr. Bethell proceeds to his operations. He has in his boat his galvanic apparatus, coils of rope ready prepared, and canisters ready charged. He takes out a coil; untwists the end for a short distance, removing also the cotton and varnish; he then twists the ends of the two wires, one into each of the loops projecting out of the canister top. The ends of the wires and the loops, both of which we have stated to be without varnish, are then coated separately with sealing wax—a non-conductor likewise. Thus Mr. Bethell obtains what he wants; a double chain of communication, properly insulated, from his boat to his charge of powder in the canister. He has then only to send down a diver to lodge the canister in its proper place, letting out the galvanic rope as he descends; and on the return of the man all is ready. The two wires are separated at the end of the rope in Mr. Bethell's hands; he brings one into connexion with each pole of the galvanic apparatus: the galvanic fluid finds an unbroken chain of communication down to the platinum wire in the canister: quick as thought the platinum grows red hot, and the explosion takes place as was desired.

Repeated experience has proved the efficiency of Mr. Bethell's contrivance. He has used a battery of six cells, and has found it sufficiently powerful for his purpose when using a galvanic rope of 100 yards. But so long a rope is seldom necessary in practice; for a charge of two or three pounds of blasting powder is found to produce no other effect than a wave on the surface, when exploded thirty feet under water. Mr. Bethell states, however, that one of Professor Daniel's six-cell batteries will ignite a charge at the distance of 300 or 400 yards. This would insure the safety of the operator in most cases where danger arises from the common modes of blasting; and with more powerful batteries, the effect might be produced at much greater distances—miles off, says Professor Daniel. The same method is, of course, applicable to the blasting of rocks under water, an operation frequently necessary in the construction and improvement of harbours, and in other marine works. For these purposes, also, Mr. Bethell's improved diver's dress, before alluded to, will be found of great service.

The economy of Mr. Bethell's process is very great. In all cases, the canister is, of course, blown up: by that which we have been describing, instead of an India rubber tube reaching from the boat to the charge, there is destroyed only about six inches of the galvanic rope—about a foot of common copper bell wire saves, shall we say fifty yards of India rubber tube?

Mr. Bethell's improved process is plainly capable of application to all cases where blasting is used. In military engineering, for example, it offers the grand advantage of enabling the officer himself, in safety and at a distance, to apply the match (as he would say) to a number of mines almost simultaneously, and blow up the enemy with the utmost precision. A galvanic battery indeed would at first amuse both officers and men; but as the novelty wore off, it would take its place among the paraphernalia of war, and make itself respected. It is the frequent fate of useful inventions to be first laughed at, then tried, then used—and, last of all—praised.

We confess, however, that we have always far greater pleasure in witnessing the application of new discoveries in science and ingenious inventions in the arts, to the pursuits of peace, than to the deeds of war. Man ever appears in the noblest light when employing his intellectual endowments in directing the powers of Nature rather to the preservation than the de-

struction of life. And we do hope that great good will arise from the application of Mr. Bethell's process of blasting to the purposes of mining. Lay in a mine as many blasts as you please—you may then call off all your miners and place them out of reach of danger, and explode the whole at once. The superintendent of the mine in his office, or the proprietor in his parlour, may fire all the blasts—the miner may lay the charge; but let him try to light the copper wire as long as he pleases—the platinum remains cold till the galvanic fluid darts into it and fires up the explosion at once.*

Min. Rev.

Signor Pistrucci's new method of striking up Medals without the aid of engraving. By Wm. Baddeley.

Signor Pistrucci's first application of his new process, has been in striking up a seal for the Duchy of Lancaster. This seal is four inches in diameter, of sterling silver; one side presents a very beautiful equestrian figure of her Majesty, Queen Victoria, surrounded by a bold inscription; on the reverse, the arms of the Duchy are richly emblazoned, in the midst of a profusion of scroll-work, with an inscription. To have *engraved* the two dies for striking up this seal, would have taken about fourteen or fifteen months hard labour, with the risk at the end of that time, of the dies breaking in the process of hardening. By Signor Pistrucci's method, they have been produced in less than fifteen days.

There is an exquisite softness, and a boldness of relief, in many parts of this seal not attainable in an *engraved* die; the graceful flowing of the drapery, the prominence of the arm of her Majesty, as well as the ear and hoofs of the horse, are altogether unrivalled. The fame of Signor Pistrucci's success has drawn to the Mint, most of those who are celebrated for their practical acquaintance with the powers and properties of the metals, and with mechanics generally; one and all of whom have expressed themselves astounded at the results obtained. When such gentlemen as Bramah, Maudslay and others, state, that nothing short of seeing with their own eyes would have satisfied them of the possibility of such a work, incredulity may well be pardoned in those who have not witnessed the recent production. There are plenty of workmen in the Royal Mint, well versed in all the methods employed at the *Soho* for the last fifty years, and they all agreed in designating Mr. Pistrucci's plan, when first propounded to them,—as a *new fangled and impossible scheme*, and yet have these very workmen themselves since proved its *possibility*.

The outline of Signor Pistrucci's plan, is tolerably well explained, in the *Times* newspaper; the subject is modeled in the usual way, either in wax, clay, or other fit material, from which a cast is taken in plaster of Paris. The plaster cast being hardened, is moulded in fine sand with great care, and a cast, in iron, is taken from it. The great *secret*—if there can be any secret in what has been published in the leading journal of the day, and thence very extensively copied into other publications—consists in the *thinness* of the *iron castings*. The plaster of Paris

* See Jour. Frank. Inst., vol XII, page 221, (Oct. 1833,) for a paper by Dr. Hare, in which the same mode of blasting by galvanic ignition, is suggested and described. The practical part of the operation as recommended by Mr. Bethell, is perhaps more simple and effectual—the result of frequent trial and experiment—but the principle is the same. G.

model is left only about one eighth of an inch thick, the consequence of which is, that the *chill* which takes place on the *surface* of all iron castings, from the proximity of the two surfaces in this instance, pervades the whole mass, giving it the hardness of a hardened steel die, with a toughness, not attainable by the latter metal while in a hard state.

In all large castings, the contraction of the mass of metal in cooling causes a shrinking of all the finer lines, while in thin casting, the sharpness of every line is preserved with surprising beauty.

The iron casting having been made perfectly flat at the back, a hollow is turned out in a steel bed to receive it, and when thus mounted it is ready for use. One proof among many others, of the extreme hardness of the cast iron dies, is afforded by the fact, that no extension of the metal takes place from the severest blows: the die fitting no tighter into its bed after striking up a medal, than it did before. The seal before alluded to, took upwards of one hundred and fifty blows from the most powerful press in the mint, and the dies appear in every respect as perfect now as when first cast.

Many persons, who, from their known celebrity and eminence in the scientific world, would be considered the very highest authorities that could be cited in a question of this kind, have not only on examination admitted the *entire novelty* and great importance of this process, but have charged Signor Pistrucci with injustice to himself, for neglecting to secure the privileges of a patent. This, however, the Signor has from the first declined to do; choosing rather to throw open the result of his (miscalled) "hours of idleness," for universal public benefit.

What the real value of this discovery is—or where the useful application of the fact thus established will stop, it is at present wholly impossible to imagine. The advantages of being able to produce at so little cost, and in so short a space of time, the most perfect and beautiful designs—or to copy with so much facility the choicest productions of others, are altogether incalculable. One drawback, perhaps, is the power thus placed in the hands of the fraudulent copyist, and the spurious coiner; but the knowledge of an existing power to do certain mischiefs generally produces an antidote sufficient for the evil, and it is to be hoped the present case forms no exception to the rule. One happy effect of the general introduction of this method of obtaining *dies*, will be, to make the *die-sinkers* more of *artists* and less of *mechanics*, to wield the graver *less*—but the pencil *more skilfully*. Should my endeavours to render this useful process intelligible, not be sufficiently explicit, I shall have much pleasure in affording any additional information that may be thought necessary.

Lond. Mech. Mag.

Simple Letter Copying Machine. By N. S. Heineken.

The object of this contrivance is to afford to the traveller a portable instrument for copying letters, &c. It consists simply of a brass tube 14 inches long and 1¼ diameter. One end, which has a bottom soldered into it and a cover fitted to it, contains a small bottle of copying ink. To the inside of the cover of the other end is attached a brush for the purpose of damping the paper. The space between is occupied by sheets of copying paper, together with some oiled paper and thick blotting, or filtering, paper

in a cover. To use the instrument it is only necessary to place a sheet of copying paper between the leaves of blotting paper, which have been previously wetted with the brush, and to let it remain till sufficiently damp —or, more expeditiously, to damp the copying paper itself with the brush and allow the dry blotting paper to absorb the superfluous moisture. Place the paper thus prepared upon the letter, &c., and over it a piece of oiled paper and roll the whole tightly upon the outside of the brass tube which may be then rolled under the hands upon a table; a copy may thus be readily taken off. The tube also serves the purpose of a ruler.

Lond. Mech. Mag.

Manufacture of Salt for Dairy Purposes.

The Dutch are remarkably particular as to the proper quantity and quality of their salt, of which there are three kinds manufactured. The small salt for butter, which is somewhat smaller than the common salt made in this country, is boiled, or evaporated, in 24 hours. This kind is also used, as already mentioned, in mixing in some districts with the Kanter cheese. The second salt is evaporated by a slower process, in about three days. It is used in salting by outward application, the Edam, Gouda, and in some places, the Kanter, cheeses. This kind is beautifully formed in natural crystals of about half an inch square. The third kind is larger sized; the crystals are nearly an inch square, and the evaporation process lasts four or five days. It is sometimes used for salting the cheeses by outward application, but principally for curing fish, beef, pork, &c. The Dutch pay great attention to the exact quantity of the particular kind of salt necessary, so that we never find the cheeses made in Holland salted to an intolerable degree, as we sometimes experience in this country. I (says Mr. Mitchell) endeavored to discover the mode of manufacture, and learned some particulars on this important subject, but there appeared to be some secret in the process, which the manufacturers were unwilling to disclose. One thing is certain, that the use of the Dutch salt is one of the causes of the sweet and delicious flavour of their butter, which, although always well flavored, hardly tastes of salt, or rather of that acrid quality which the poisonous bittern of the muriate and sulphate of magnesia, pervading our common salt, imparts to our butter; and this is very obvious in comparing the Dutch butter with the best salted butter of this country. When it is considered that the health and prosperity of the people are materially concerned in the use of this article in so many various ways, the propriety, or rather necessity, of improvement in its manufacture will be more evident, and it is rather remarkable that whilst chemistry has now advanced to such perfection, no change has taken place in the mode of making salt for several centuries. The late scientific Earl of Dundonald, the late Dr. Coventry, and the Rev. James Headrick, proposed important improvements in the mode of manufacturing this article, which, however, seem never to have been adopted.—*Times.*

London Mechanics' Magazine.

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE, BY J. GRISCOM.

Report made to the Academy of Sciences, on the Filtering Apparatus of Henry de Fonvielle. By M. ARAGO.

The Academy has charged M. M. Gay Lussac, Magendie, Robiquet and myself, with an examination of the filtering apparatus of M. Henri de Fonvielle. The question of filtration is so important and so keenly agitated at the present time, that high authorities, the municipal administration of our chief cities, as well as private individuals frequently consult the Academy on this subject, so that it has appeared to us to be proper to consider the problem in all its bearings. It is, besides, the best mode of suitably appreciating the new method on which we are appointed to decide.

Mankind use for drink, for cooking, for cleanliness, and for the useful arts, cistern water, well water, spring water, and river water. These four kinds of water have one common origin—rain. Rain water is, in general, so pure, that foreign matters can be detected in it, only by means of very delicate chemical reagents.

Cisterns, constructed with well chosen materials, would therefore be the best means of obtaining excellent water for drinking if the rain all fell directly into them, and did not bring with it dirt, dust, insects, accumulated in dry weather on the roofs and terraces over which it flows. In certain localities, as at Venice, for example, the inconveniences now alluded to are felt to such an extent, that they found the necessity of causing the rain water, before it reached the great cistern of the Ducal Palace, which was much resorted to by the public, to pass through a thick bed of porous materials, in the interstices of which the foreign matters held in suspension might be in part deposited.

Wells may be compared to cisterns, only they are not supplied by channels of brickwork, stone or metal. The water of the clouds reaches them, if we may so speak, drop by drop, through the common, capillary openings of the soil. It is rare that in this long and difficult trickling in fine streams, the water does not meet with soluble materials, which it dissolves in greater or less quantity. It is not therefore strictly speaking, rain water that we draw from our wells: it is generally as clear and limpid, but it contains, almost always, matters dissolved, whose chemical nature varies with the geological constitution of the country.

The same remarks are applicable to springs. The water which they distribute is also rain water, which, having passed through more or less of the crust of the earth, is returned to the surface by a siphon stream, or in other words, by pressure through streamlets of water from a more elevated situation. The nature and the proportion of foreign matters in spring water depend also on the extent of the streamlets which feed the source and the nature of the rocks through which they percolate. When these rocks are of a certain kind, the country will abound in mineral springs. If the vertical descent of the fluid is of a certain extent, the water will issue in a thermal (warm or hot) spring.

Every river bears to the sea, the waters of some principal spring, and those of a certain number of others, of minor importance, which unite with the main one in its passage. In chemical composition the water of a river might thus seem to be a medium between those of all the springs of the

surrounding country; but it must be observed, that at the time of freshets or heavy rains, (and if the valley of the river be extensive, these may occur very often) the fluvial waters do not sink into the earth in large proportions, but flow over its surface in great abundance and with great rapidity; and that in this superficial flow they can dissolve but a very small portion of foreign matter, compared with that which they will take up when divided into minute streams, and pursuing an underground course, during which the particles are so constantly in contact with soluble materials. To these considerations in favour of the purity of river water, must be added the fact that carbonate of lime is dissolved by aid of an excess of acid, and that this excess is dissipated during a long exposure of water to the air, in consequence of which the carbonate itself is precipitated.

These remarks, moreover, are to be considered only in a general point of view. It would not be difficult, in fact, without departing from the known laws of Geology, to imagine, and even to find arrangements of strata, whose wells and springs would furnish pure water, while the neighbouring rivers on the contrary, might contain a strong saline impregnation. All that we aim at is to explain how the reverse of this generally takes place,—how the water of the Seine and of the Garonne, for example, are notoriously purer than the waters of most of the springs and wells of the countries through which these rivers respectively flow.

But the advantage of greater purity in river water, chemically considered, is more than lost by their habitual want of limpidity. At each heavy rain, the little torrents are precipitated into the stream, loaded with vegetable soil, clay, gravel and all sorts of detritus which they tear up from the land, and these heterogeneous ingredients are driven along until they are gradually deposited in the river's bed.

The proportions of these foreign mixtures held in suspension during freshets, are not the same in different rivers, as might well be expected. In the Seine, this proportion rises sometimes to $\frac{1}{2000}$. He, therefore, who should drink in the course of his day's work, three quarts of the unfiltered water of the river, at the time of its highest flow, would load his stomach with more than a scruple of sand and mud. What effect, must not this, in time, produce upon his health? The question has been much discussed and it has left physicians and hydraulic engineers, very much divided in opinion. For want of exact experiments, both parties agree to leave the question where they found it. We shall certainly not be considered too severe in our judgments, if we add that one of the declared partizans of these troubled waters, rests his opinion on the alleged observation, that animals, cattle especially, do not begin to drink from the pools which they meet on the way, until they have well stirred up the mud with their feet!

But, every consideration of health aside, it is certainly very disagreeable to drink water charged with dirt. At all times and in all countries, limpidity has been regarded as a necessary quality of the water destined for human beverage; and on this account, long before the invention, or at least the perfection of the means of filtration, the ancients deemed it necessary to dig deep wells, at great expense, or to bring in by magnificent aqueducts, the water of natural springs, even when their towns were situated on ample rivers.

It is by its rapid motion through, or over, the ground, that water becomes loaded with mud. By repose, this is precipitated and the fluid resumes its natural transparency. Nothing is certainly more simple, than this mode of clarification; it is unhappily excessively slow.

From the very interesting experiments and calculations made at Bourdeaux, by M. Leupold, we learn that after 10 days of absolute repose, the water of the Garonne, taken at the time of a freshet, had not returned to its natural limpidity. At the commencement, it is true, the larger particles subside very fast, but the finer go down with a slowness which would put all patience at a stand.

Simple repose then cannot be resorted to as the means of clarifying the water destined for the supply of a large city. Who does not perceive that 8 or 10 separate basins would be necessary, each of sufficient capacity to contain all the water necessary for a day's consumption? Add to this tha in certain places and at certain seasons, water exposed in a stagnant condition to the open air during 10 consecutive days, would become foul and taste badly, either on account of the putrefaction of innumerable insects which would fall into it from the atmosphere, or in consequence of the vegetation which would begin to take place on its surface.

Repose, however, may be considered as one valuable means of getting clear of the grosser particles which are held in suspension. It is under this point of view *only*, that basins and reservoirs have been contrived and established in England and France*.

Science, or rather chance, brought to light the means of hastening considably, or rendering almost instantaneous, the precipitation of earthy matters held in suspension by water. This means consists in adding powdered alum to the turbid water. It is averred that at Paris, the gross slime brought down by the Seine, collects into long thick strings which are very promptly deposited when alum is added. The theory of this operation ought to claim the attention of chemists. It is not at present sufficiently certain, to justify us in affirming, that the same effect would take place in the sediment of every river. Some doubt seems admissible from the fact that the clarification by alum is not always complete; that certain very fine particles escape the action of this salt, remain in suspension, and render the liquid somewhat cloudy (louche) when all the stringy portions have disappeared. If it is true that water after having been alum'd, still requires filtration, we can easily conceive why the employment of alum, as a means of clarification, has not become general. Besides, in the large way, the price of the salt in addition to other means, might be objectionable. Another more serious objection is that it affects the chemical purity of river water, that it introduces a salt which it did not before contain,—that in supposing this salt wholly inactive in certain proportions, consumers might fear that at times these proportions might be very materially exceeded, and that this might easily happen through the negligence, or mistake, of a workman. One of the committee (the reporter) was speaking one day of the aluming of water to an English Engineer, whose extensive experience had given him much practical acquaintance with the habits and feelings of the public, and who was lamenting the imperfection of the means now in use for purifying water,—"what are you proposing!" said he immediately: "water, like Cesar's wife, ought to be beyond all suspicion."

This, in terms perhaps singular, but true, is a pointed condemnation, of every means of clarification which would introduce into river water any new substance, that it does not originally contain; and therefore the

*The author appears to forget that reservoirs are indispensable, as the means of insuring a regular supply when the water has to be forced to a greater height, by means of machinery, in order to bring it to the requisite hydrostatic elevation, as in the water works of Philadelphia, Wilmington, &c. TRANS.

most recent trials of engineers have all been directed to the employment of inert materials, or those which cannot add any thing to the water. These materials are gravel of different sizes,—sand of different degrees of fineness and pounded charcoal.

The idea of applying gravel and sand to the clarification of turbid waters was certainly suggested by observing so many natural springs issuing from sandy bottoms with remarkable limpidity; hence the practice is very ancient, and hence do we ascertain it to have been in vogue, in the Ducal Palace at Venice. A bed of fine sand appears to act, in the clearing of water only as a mass of sinuous capillary tubes, through which the liquid molecules may pass while the earthy matters in suspension are arrested, in consequence, simply, of their greater dimensions.

From the experiments of Lowitz, Berthollet, Saussure, Figuier, M. M. Bussy, Payen, and some other chemists, it is now known by almost every body, that charcoal has the property of absorbing the matters resulting from the putrefaction of organic bodies. The part which charcoal acts therefore in the purification of water cannot be doubtful.

Theoretically considered, the art of the clarifier, appears to be nearly complete; but this is very far from being the case with respect to its economical and successful application, especially when the object is to conduct the operations on a great scale.

Very extensive filtering apparatus has been put into operation by our neighbours on the other side of the water, and especially at Glasgow. The cost of these essays must be counted by millions (of Francs.) Nevertheless they have not been successful, but on the contrary, they have occasioned the ruin of several powerful companies.

Those who are engaged in the amelioration and extension of the useful arts, may certainly find excellent guides in natural phenomena, but on the express condition that they do not allow themselves to be seduced by imperfect similitudes. Such has been, we venture to affirm, the principal origin of the errors committed in Scotland. Certain springs, it was said, flow uniformly without interruption; they have for ages furnished the same quantity of transparent water; why should not the same result follow from an artificial fountain, under analogous circumstances. But, in the first place, is it certain that these natural springs, of which so much account is made, have experienced no diminution? where are the wooden conduits by which they have been measured? who has compared their issues, cautiously, year by year, with the quantity of rain which has fallen? Moreover, (and herein it is that the Scotch engineers have particularly erred) in an artificial fountain, the filtering strata must always be of limited extent, while the waters of a natural spring are clarified, sometimes, by beds of sand which spread over whole districts, and which act upon a fluid which is but little troubled. In the first case, the capillary tubes of the filter will soon become foul; while in the second, the effect will scarcely be visible.

The result is, that no artificial method of filtration can be successful, unless prompt, economical and certain means are at hand, of cleaning or renewing the filters. Only one of eight large companies in London, that clarify the water, viz. the Chelsea company, has attained its object. This has been done by the construction of three large basins communicating with each other; in the first two, the coarser terrene particles are deposited by repose; in the third, the water traverses a thick bed of sand and gravel whereby it becomes definitively purified. When this basin is empty, the fil-

trating mass of sand is exposed, at which time, workmen immediately remove by rakes the superficial layers which the sediment has rendered foul, and replace it by fresh sand.

A thought here suggests itself. It is not certainly, without a good reason that the able engineer of the company has made his filtering bed 6 feet thick;—the superficial layers, which the workmen remove from time to time, act without doubt more effectively than the others; but those below, must nevertheless have some influence, and must also by degrees become engorged with the matter arrested, daily become less efficient, and in time the whole must require to be changed. The necessity of this, when anticipated, would require the agency of a fourth basin, like the third, and like it of the extent of an acre of ground. The total expenditure in these works has amounted, to from 300,000 to 400,000 francs; and the manipulations of the filter, which cost annually not less than 25,000 francs, must be continually increasing.

Is it surprising, that in the view of such heavy expenses, encountered by the Chelsea Company for the filtration of 10,000 cubic metres of water per diem, corresponding to about 500 square inches of main pipe, the other English companies, should all, in an examination before parliament, declare that if compelled to filter the water of the Thames, their rental prices would have to be raised 15 per cent.

The system which Robert Thom, a civil engineer at Greenwich, introduced in 1828, has the advantage over that at Chelsea, of a self-cleaning operation, to which the whole filtering mass is subjected. This mass forms a bed 5 feet thick. The water is admitted into the basin, filled with sand, either above or below, at pleasure. If the filtration, for example, is by descension, as soon as it is perceived that the filter is obstructed and becomes effete, the water is, for a while, introduced below, and in its ascensional movement it drives the sediment from the upper surface into a discharging pipe destined to receive it.

Filtration, has not, hitherto, been attempted in France on a very large scale. In several valuable establishments in Paris, at which it is performed, a large number of small boxes, lined with lead, open at top, are provided, and contain at bottom a bed of charcoal between two layers of sand. These are, in fact, the old filters patented by Smith, Cochet, and Montfort. When the waters of the Seine and Marne, arrive at Paris, very highly charged with silt and undergo depuration in those boxes, it is found necessary to renew the strata, or at least the upper one, every day, and even twice a day.

Each superficial metre of filter gives about 5000 litres, (nearly 800 gallons) of clarified water every twenty-four hours; hence it would require 7 square metres, or 7 cubic boxes of one metre in the side, for every inch of fountain pipe, and 7000 such boxes would be requisite for the service of a town, where the consumption would demand 1000 inches.

There is a very simple method of increasing the product of these little boxes; it is to close them hermetically, and to cause the water to pass through the filtering mass, not by its own weight merely, or by a simple charge, but by strong pressure.

This, gentlemen, is one of the improvements in the filtration of water, which is proposed, and which has been realized, by the author of the memoir committed to our examination.

The filtre of Henry de Fonvielle, at the Hotel-Dieu, though it has not one metre of superficial extent, yields daily, by a pressure of 88 centimetres,

(= 34.6 inches of mercurial pressure, = $1\frac{1}{6}$ atmospheres.) 50,000 litres, (= 13,200 gallons,) at least, of clarified water. This amount, deduced from an examination of the various services of the Hospital, is a small part of what the apparatus might furnish if the feeding pump were constantly in operation. At certain times we found, in fact, by direct experiment, that the filter would yield as much as 95 litres, (= 24 gallons,) per minute. This would be nearly 137,000 litres in 24 hours, equal to about 7 inches of pipe. But the quantity first named is 17 times greater than by the methods commonly in use.

Since M. de Fonvielle presented his memoir, and especially since the results at the Hospital, several persons, and among others M. Ducommun, have claimed the invention of filtering by increased pressure. In mathematical strictness these claims might perhaps be sustained; for to a greater or less extent, it is unquestionable that in every machine existing, or known only by patent, and particularly those that filter by ascension, there is a pressure, it may be of some inches; but, regarded in a practical point of view, the question is a very different one. It is whether any one, before the author of the memoir, proposed to effect the filtration of water in vessels *hermetically closed*, allowing nothing to escape, from the pressures which the locality or the machine can produce; whether any one, prior to de Fonvielle, had arranged a filtering apparatus in such a manner that *strong* or high pressure would not derange or confuse the different layers;—whether in fact, any one before the experiments at the Hospital, had proved that a rapid filtration would give a fluid so limpid as to be perfectly satisfactory. In all these respects the rights of M. de Fonvielle appear to us to be incontestable. From the parliamentary enquiry before alluded to, we learn that engineers had not been unmindful of the possibility of effecting filtration under moderate pressure,—and that some had adopted this mode in a manner which involved them in hydraulic errors. In France we find every where, and especially at the beautiful mineral water establishment at Gros-Caillou, a fine disposable high pressure, entirely neglected. We see in fact, M. Ducommun, whose name is so honorably known in this department of the arts, using at the Hotel-Dieu, three cisterns to clarify 15 hectolitres in 24 hours, while a single one of these cisterns, modified by de Fonvielle, yields in the same time, agreeably to the report of M. Desportes, steward of the Hospital, 900 hectolitres of water, perfectly filtered, in lieu of the 15.

But the employment of high pressure is practicable only in combination with another process of which no one contests the invention with the author of the memoir.

We have seen, in time of freshets, a filter of one square metre, requiring to be cleansed once at least in 24 hours, although it would clarify only 3000 litres of water. It would seem, at the first view, that the filter of M. de Fonvielle which clears 17 times more, must require cleaning every hour. Such however, is not at all the case. No more attention is requisite than in ordinary filters.

The explanation is simple enough when we remark that under a feeble pressure, a filter acts as it were, only at its surface,—that the mud scarcely penetrates it, while, under great pressure it may, or must, sink deeper. No one will deny that if more turbid water passes in a given time, there must be a proportional deposition of feculent matter, but if this be found disseminated through a greater depth of sand, the permeability of the filter, will not be more changed by it,—the cleaning merely will be more difficult;

it is in this respect, above all others, that the new process is worthy of attention.

We have already stated that at Greenock, the engineer, R. Thom, cleans the mass of sand, by a rapid counter current, viz: from bottom to top. This mode may suffice, when the filters are choked only at the surface; but the filters of M. de Fonvielle require more powerful means. This the author finds in the action of two counter currents,—in the shock, and sudden shaking and stirring which result from them. In cleaning the hermetically closed filters of the Hotel-Dieu, the workman, whose business it is, opens suddenly, and almost simultaneously, the cocks of the tubes which connect the bottom and top of the apparatus with the elevated reservoirs, or with the body of the feeding pump. The filter is thus tumultuously agitated by two cross currents, by which it is acted upon in a manner not very unlike that which a garment undergoes in the hands of a washerwoman. These currents, have, in every case, the effect of detaching from the filtrating gravel, the foreign matters which would otherwise remain adhering to it. We have no doubt of the great utility of these conflicting currents; for after having cleaned the filter of the Hotel-Dieu, agreeably to the method of engineer Thom, i. e. by an ascending current, after assuring ourselves that this ascending current came out limpid,—as soon as the two other cocks were opened, the water rushed out from the filter in a very filthy condition.

We may add the passing remark, that the patients who witnessed the operation, expressed their great surprise at seeing, after an interval of a few seconds, the same fountain furnish, first a yellow mass as thick as soup, and then water as clear as crystal.

We may add to these numerous details, that the process which you have charged us to give an account of, has received the sanction of time. For more than 8 months it has been in operation at the Hotel-Dieu; for more than 8 months the same bed of sand, of at least a square metre in surface, has performed its functions without intermission; that there has been no occasion of renewing it; that the Seine, nevertheless, within this period has been extremely foul, and that, at the lowest estimation, 12 millions of litres of water, (12000 cubic metres,) have passed through the apparatus. From these various circumstances we have deemed it unnecessary to make any trials of the further advantages which the author of the memoir expects to derive from a division of the thick filtering body now in use, into three beds, separated from each other; and in confining ourselves exclusively to what we have sufficiently examined, we do not hesitate to say that in showing the possibility of clarifying large quantities of water with a very small apparatus, M. Henry de Fonvielle has made an important advancement in the arts.*

Progress of Civil Engineering.

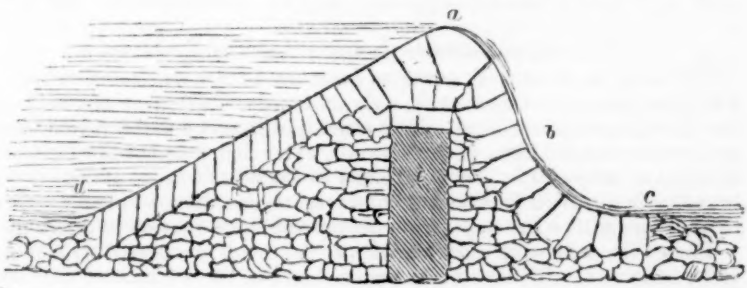
On the most proper sectional Form to be given to Weirs or River Dams.

By Robert Mallet.

The section of weirs or dams, when of masonry, appears, in most

*May we not take the liberty of suggesting the probability, that if the ascending current of water at Fair Mount, were made to pass through a tight box, containing the requisite filtering materials, agreeably to the admirable contrivance of De Fonvielle, it might furnish a simple and unexpensive mode of clarifying the water, of the river, which, at certain seasons, is so turbid as to be almost past endurance. Trans.

instances, to be pretty nearly a rule of thumb business, with the exception of some examples by Mr. Telford. The model of an earth embankment appears to have been adopted for stone ones, with but little care either as to the best position for the stones of the masonry, for maximum strength, or as to the outline that would give the easiest descent for the falling fluid, and, by consequence, the least wear and tear to the structure. Not to encumber your pages with a parade of analysis, I shall just state the results I have arrived at, and leave your mathematical readers, who will at once see what I would be at, to judge for themselves; while the practical man can discern from the figure whether the positions and forms I have assigned to the stones of the masonry are the most suitable. Supposing, then, the plan of the weir to be an arch pointing up the stream; I conceive the line of section, from *d* to *a* in the annexed figure, should either be a right line, or, pos-



sibly, a parabolic segment, presenting a convex inclined surface to the water in very deep streams. The line from *a* to *b*, I consider, should be a parabola, to which the water-level should be a tangent; because this curve gives the easiest change from direct to curvilinear motion, and hence with the least expenditure of force. Lastly, I think the line from *b* to *c* should be a cycloid, as being the curve of quickest descent; so that the combination of these two curves will fulfil the condition of giving the easiest change of motion to the water, from a rectilineal to a curved, and back again to a rectilineal, possible, and hence the minimum wear and tear to the structure; whilst they possess the co-ordinate property of a judicious form to resist the hydrostatic pressure.

I believe a weir thus formed would cause the fluid to descend in every part in an unbroken sheet, and produce little or no ripple below it. I also think the principles of the form are now for the first time stated.

Arch. Mag.

Canal parallel to the Banks of the Rhine, from Basle to Strasburg.

M. Fourneyron has communicated to the Academy the project for a railroad, with a parallel and navigable canal, from Basle to Strasburg, by Mulhouse, Colmar, &c. It has been found, that, at low water, the waters of the Rhine, in their passage from Basle to Strasburg, have a force of from 400,000 to 500,000 horse power. The project in question consists in collecting a very small part of this power, by means of a lateral canal, upon which 100 mètres, (325 ft.) of elevation will be divid-

ed into thirty falls, from Mulhouse to Strasburg. On this line a total force of 40,000 horse power will be obtained, which will produce an annual revenue of about 40,000,000 of francs. Alsace is now covered with steam engines, for which fuel is procured at about 80 or 100 leagues' distance. The expense of a steam engine is reckoned at 1200 or 1500 francs for each horse power, by the year; and it is believed that by the projected canal this same power might be produced for 200 francs per annum.

It is also proposed to form a railroad between Basle and Strasburg, upon which the wagons would be moved by hydraulic power (moteurs); for which purpose it is intended to employ another part of the strength of the waters of the river. The wagons and the diligences on this road would go at the rate of from six to eight leagues an hour.— *L' Echo*, Dec. 13, 1837, p. 207. Arch. Mag.

A Temple dedicated to the eminent men of Germany.

The king of Bavaria is going to erect an edifice dedicated to all the worthies (gloires) of Germany, on a mountain situated on the banks of the Danube, near Ratisbon. The mountain is to be divided into terraces, and on the platform, at the summit, a Grecian temple will be erected. A flight of steps 60 ft. broad will lead to the first terrace; stairs divided into two flights, will lead to a second terrace, and thence to three others. In all, there will be 300 steps, from the base of the mountain to the temple.

The edifice will be of grey marble: the exterior, decorated with pillars and pediments, will have some resemblance to the Madeleine at Paris. The pillars will be 54 in number, and of the same color as the rest of the building. Under the vestibule, will be an entrance 24 ft. high, which will have a bronze door, leading to a gallery 150 ft. long by 50 ft. broad, and nearly the same height. Projecting pilasters (des pilastres mis en saillie) will divide this apartment into three sections; and are intended to break the uniformity. The ceiling of each section will be in the form of a tent, and will be covered with bronze, and perforated for a skylight. Above the cornice, on both sides, a row of red marble panels will contain, in letters of gold, the names of those celebrated men whose portraits have not been obtained. Fourteen giants, representing German warriors, will support the ceiling above the pillars and pilasters.

In the gallery, the busts will be arranged along the walls, on stylobates of grey marble. This gallery will be separated by pillars from a back chamber *(arriere salle)*, executed in imitation of the opisthodome of the Greek temple. A frieze 300 ft. in length will extend along the gallery, on which the most remarkable events of ancient Germany will be sculptured in Carrara marble. The two pediments will present two large historic pages: the one will represent the victory of Arminius over the Romans, and the other the *regeneration* of Germany, after the fall of Napoleon. The figure of these pediments will not be in bas relief: they will be in alto relievo (rondes basses), like the Pantheon at Athens. By this means, they will be rendered visible at a much greater distance.—*L' Echo*, Dec. 13, 1837, p. 201. Ibid.

Mechanics' Register.

Steaming Extraordinary.

Yesterday afternoon, Mr. Walter Hancock, the enterprising steam-carriage engineer, accompanied by two friends, rode from Stratford and through the principal streets of the City in a steam-gig! Mr. Hancock remained a considerable time with this novelty of science in front of Guildhall, now and then guiding it adroitly round the open space. This was about a quarter past four o'clock, when a great number of persons were present. A notice was painted on the back of the gig, stating that Mr. Hancock had no connexion with the "Steam Carriage and Wagon Company." Every one seemed surprised at the ease with which Mr. Hancock threaded his way through the crowd of carts, omnibuses, cabs, and other vehicles in Cheapside, Leaden-hall street, and other crowded thoroughfares. The gig stopped opposite the bank for a few minutes, when the machinery was inspected by Mr. Oldham, the Engineer, who has fitted up all the printing apparatus of that establishment to be worked by steam. During Mr. Hancock's temporary absence, much amusement was caused by one of the bank porters pompously ordering the gentleman left in the gig to "move on," the latter declaring that he could not. Mr. Hancock soon returned, when the machine, obedient to the guidance of its master "moved on" in fine style, and returned without accident to Stratford. Lond. Mech. Mag.

LUNAR OCCULTATIONS FOR PHILADELPHIA, NOVEMBER 1838.					Angles reckoned to the right or westward round the circle, as seen in an inverting telescope. ☞ For direct vision add 180° ☜	
Day.	H'r.	Min.	Star's name.	Mag.	from Moon's North point.	from Moon's Vertex.
2	8	29	N. App. ☽ & 9 Tauri 6 ☽ S. 0. '9			
2	12	41	N. App. ☽ & *b* Pleiadum 4.5. ☽ S. 0. '3.			
2	12	35	Im. *d* Pleiadum,	5	113	105
2	13	53	Em.		293	327
2	13	18	Im. χ Tauri,	3	121	140
2	14	34	Em.		280	327
2	14	10	Im. *f* Pleiadum,	5	83	125
2	15	19	Em.		314	8
2	14	11	Im. λ Pleiadum,	5, 6	100	142
2	15	26	Em.		297	351
6	16	10	Im. 2 α' Cancri,	6	106	80
6	17	23	Em.		219	245
6	16	51	Im. 4 α^2 Cancri,	6, 7	53	48
6	18	13	Em.		264	310
13	20	5	Im. α Virginis,	1	75	52
13	21	21	Em.		203	197
21	6	2	Im. 58 ω Sagittarii	6	114	141
21	7	14	Em		293	332
21	7	46	Im. 60 *a* Sagittarii,	5, 6	65	107
21	8	27	Em.		342	28
30	14	31	N. App. ☽ χ Tauri 6 ☽ N. 2. '9.			

Anti Dry-Rot Process.

The advantage arising from the application of Kyan's process for the preservation of timber, has been so generally acknowledged, and has been so well tested by experience, that its general introduction in the mining districts, is one of the natural consequences attendant on its success. It is now some months since it was first introduced in Cornwall, where its use is becoming very general; indeed, when the expense of timbering, shafts, and other uses to which timber is applied in mines, and the heavy cost attendant on works of this nature is considered, its importance must be apparent. In railway undertakings it is also adopted; and we learn with much satisfaction, that Earl Fitzwilliam has also ordered its use in the mines possessed by his lordship. This additional evidence of the estimation in which it is held, will, we feel assured, be hailed with satisfaction by all who take an interest in scientific discoveries like the present, and which in the onset, had so much to contend with, not only from popular prejudice, but from the necessity of testing it by some years experience.

Mining Journal.

Meteorological Observations for May, 1838.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise	Barometer. 2 P.M.	Wind. Direction	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inch's	Inch's			Inches.	
☾	1	46	60	30.15	30.10	W.	Moderate.		Clear—lightly cloudy.
	2	46	50	00	29.75	S.E.	do.	.31	Rain—do.
	3	46	58	29.53	64	W.N.	do.		Cloudy—flying clouds.
	4	44	49	74	70	E.	do.	.14	Cloudy—drizzle.
	5	42	53	50	3[illegible]	E.	do.	1.24	Rain—do.
	6	46	60	4[illegible]	46	S E. S.W.	do.	.7	Cloudy—do.—shower,
	7	45	62	67	70	W.S.W	do.		Lightly cloudy—do. do.
	8	45	52	70	70	N.W.	do		Lightly cloudy—drizzle.
☉	9	42	52	70	70	W.	do.		Cloudy—do.
	10	40	56	7[illegible]	76	W.	Blustering		Clear—cloudy
	11	41	60	85	85	N.W.	Moderate.		Clear—clear
	12	44	70	95	70	N.W.	do.		Clear—flying clouds.
	13	52	73	70	70	W	do.		Clear—do.
	14	50	70	85	95	NE.	do.		Lightly cloudy—clear.
	15	43	73	30.06	30.10	E.S.	do.		Clear—do.
☽	16	48	78	05	05	S E.W.	do.		Fog—partially cloudy.
	17	50	77	29.70	29.70	W.	do.		Cloudy—partially cloudy.
	18	62	64	53	54	W.	do.		Cloudy—do.
	19	46	73	80	80	S.W.W.	do.		Cloudy—clear.
	20	50	80	84	80	SW.	Brisk.		Partially cloudy—clear.
	21	56	78	81	8[illegible]	SW.	do.		Clear—cloudy.
	22	68	83	80	76	S.	do.	.45	Cloudy—rain
⊗	23	62	70	85	80	N.E S.	do.	.33	Drizzle—rain.
	24	64	71	66	66	SW.	do.		Showers—flying clouds.
	25	52	55	60	50	N.W.	Moderate.		Partially cloudy—rain.
	26	42	65	60	6[illegible]	W.	do		Clear—flying clouds.
	27	46	78	6[illegible]	50	S.W.	Brisk.	.15	Clear—flying clouds—showers.
	28	50	66	55	60	W.	Moderate.	.4	Clear—Shower.
	29	52	62	70	75	W.	do.		Cloudy—partially cloudy.
	30	46	68	85	88	W.	do.		Clear—do.
	31	54	82	90	90	W.	do.		Lightly cloudy—clear.
	Mean	49.03	66.06	29.75	29.74			2.75	

	Thermometer.	Barometer.
Maximum height during the month.	83.00 on 22d.	30.15 on 1st.
Minimum " " "	40.00 on 10th.	29.35 on 5th,
Mean	57.55	29.75